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Vol. 21. No. 4 APRIL, 1923

THE METAL INDUSTRY

WITH WHICH ARE INCORPORATED
THE ALUMINUM WORLD: COPPER AND BRASS: THE BRASS FOUNDER AND FINISHER
ELECTRO-PLATERS REVIEW

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Desilverized Lead
Copper Sulphate
White Metals
Gold, Silver
Platinum
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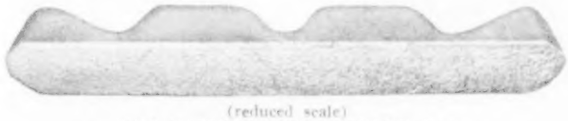
NBC CASTING COPPER INGOT



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BALBACH METALS CORPORATION
280 BROADWAY (Established 1922) NEW YORK

Contents Page 157

Lacquering — *an art that was never lost*

Courtesy Metropolitan Museum of Art.

When the Pharaohs ruled—

The Egyptian Craftsmen who fashioned this little model, depicting an incident in the life of the great Mehenkwetre, royal chancellor of Egypt in the XI dynasty, coated the figures with Lacquer and then placed it in the royal tomb, at Thebes.

The Lacquer was applied then, as today, as a preservative, for the finish. Little did those workmen dream, however, that four thousand years later the Lacquer which dripped from their brushes would still be bright. In spots, finger prints of those early handlers have blurred the lustre, but even this only adds to the proof of the durability of the coating.

Finger prints that are passed down a stretch of four thousand years speak well for the substance that holds them.

Today, modern methods applied to the maintaining of beauty of finish, duplicate the methods employed by the early Egyptians—but with this difference. The Lacquers used today—EGYPTIAN LACQUERS—are far superior to the early products of the ancients. Compounded to fit every need and material, from coating the cheapest to the most expensive plaything, EGYPTIAN LACQUERS are blended by science to give the best results whether used on metal, wood, fibre or paper.

Lacquer cost is an infinitesimal part of your cost of production, yet for the purpose of commercializing your wares it is perhaps the most important. Hence, the reason for using good Lacquers—EGYPTIAN LACQUERS.

The Egyptian Lacquer Manufacturing Co.
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Chicago Los Angeles San Francisco

EGYPTIAN LACQUERS

THE
METAL INDUSTRY
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ELECTRO-PLATERS REVIEW

Vol. 21 NEW YORK, APRIL, 1923 No. 4

Cleveland the Convention City

The 1923 Meeting of the American Foundrymen's Association to Be Held Jointly With the Institute of Metals Division, A. I. M. E. in Cleveland, April 28-May 3, 1923

Written for The Metal Industry by ROBERT M. POLHAMUS, Cleveland, O.

Cleveland is prepared to greet the 5,000 persons who will attend the national convention of the American Foundrymen's Association, April 28 to May 3. Plans for the event, the most important in the metal industries this year, are virtually completed. Final arrangements for housing the visitors are being made through the hotel managers' association by the convention bureau of the Cleveland Chamber of Commerce.

Many special features are included in the program prepared for visitors engaged in the non-ferrous industries in other cities by the local brass men's organization, including trips through various foundries, lectures by metallurgists of national repute, and an opportunity to study at close range the transfer of copper ore from the holds of great lake steamships to freight cars which transport it to smelteries and refineries.

HOTEL HOLLENDEN, HEADQUARTERS OF THE CONVENTION, CLEVELAND, OHIO

HISTORY AND BACKGROUND

Cleveland has a population of 957,000 (city directory, 1922) and is ranked fifth among the cities of the United States. Greater Cleveland, however, including a score of villages and suburban cities within a radius of ten miles, has a total of more than 1,250,000 inhabitants.

The city was fortified in 1796 by Gen .Moses Cleveland and received its first charter in 1814. From the outset it was carefully planned, and today the city's thoroughfares are in exactly the same location as they were before the beginning of the nineteenth century, being extended in length with the growth of the city.

If the temperature of the earth had not changed a few thousand years ago the streets of Cleveland would be under a vast ice-mountain. This mountain moved down from the north pole, scoured the land surface and carried ponderous boulders and rich soil before it. In rocky places one can still see the grooves where the weight of this mass ground along. There was one particularly deep groove, known now as Lake Erie.

As the centuries followed Lake Erie grew smaller. Its cold waters sank into the earth and found their way to the sea. The successive shores it left were soggy, capped only with a thin layer of solid sand. Cleveland is built within this area of pre-historic quicksand, which to this day gives trouble when foundations are being laid.

The mound dwellers are reputed to have been the first dwellers of this region centuries before the advent of the Indians into the forests of what is now Ohio. The first known Indians to have settled on the present site of Cleveland were the Eries, from whom Lake Erie derives its name. The Hurons and the Iroquois, from east and west, made war upon and absorbed the Erie nation.

CLEVELAND AS AN INDUSTRIAL CENTER

Cleveland is stragetically situated on the chain of Great Lakes at the point where coal from Pennsylvania and West Virginia meets ore from the Lake Superior region, and has one of the finest inland harbors in the world. The city has fourteen miles of waterfront, and is served by forty-five steamship lines.

The metropolis of Ohio is one of the most important manufacturing centers in the world. More than 14,000 different articles are manufactured in the city. It is the largest producer of wire goods, electric incandescent lamps, astronimical instruments, twist drills, vacuum cleaners, electric storage batteries, printing presses, street cars, iron castings, hardware and plumbing fixtures in the world.

Ninety-one factories in Cleveland devote their entire time to the manufacture of electrical materials, and almost 300 others turn out large quantities of such goods. Nela Park, the huge experimental and incandescent lamp production center of the General Electric Company, is located in the city.

Claims regarding the birth-place of the American automobile are conflicting, but it is recorded by Thomas A. Edison that the first motor car was constructed and sold in Cleveland by the White Company. Today Cleveland ranks second among the cities of the world in the production of motor cars, eleven different makes being manufactured there.

CLEVELAND AS A CONVENTION CITY

Cleveland is today acknowledged to be one of the best convention cities in the Central States. Its location is advantageous; one-half the population of the United States and Canada is within a radius of 500 miles of the city. It may be reached overnight from the Atlantic seaboard cities or the Mississippi river. It is easily accessible either by rail or boat. More than 100 passenger trains, including trans-continental limiteds and the famous Twentieth Century flyer, pass through the city daily. A score of interurban lines connecting points in Pennsylvania, Indiana, Michigan and New York, as well as all of the larger cities of Ohio, radiate from Cleveland.

The principal hotels have been designed and located to fulfill every convention requirement. One of the many distinctive features is that all assembly parlors, banquet halls and committee rooms have been arranged around the mezzanine floors of the hostelries. There are 83 hotels within which any influx of tourists or convention visitors can be comfortably accomodated. More than six thousand rooms are available in downtown fireproof hotels, all centrally located.

In no other city is auditorium space more ample than in Cleveland, and the new public auditorium, municipally owned and operated, is the largest building of its kind in the country. The public hall has a seating capacity in the main arena of 13,900 persons, with 75,000 square feet of floor space for exhibtion purposes adjoining. Five other auditoriums have seating capacities ranging from 3,000 to 6,500. It is in the mnuicipal hall that the foundrymen's convention will be held.

The central location of the city is responsible for the establishment in Cleveland of national headquarters of the following organizations: Brotherhood of Locomotive Engineers; Brotherhood of Railway Trainmen; Brotherhood of Locomotive Enginemen and Firemen; Commercial Protective Association; Employing Photo-Engraving Association; National Paving Brick Manufacturers' Association; National Association of Retail Grocers; National Association of Steel Furniture Manufacturers; National Cloak, Suit and Skirt Manufacturers' Association; National One-Cent Letter Postage Association, and National Petroleum Association.

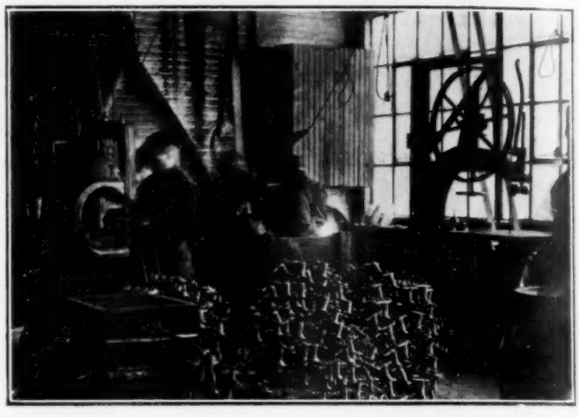
METAL SHOPS IN CLEVELAND

Statistics on non-ferrous foundry and machine shop products for Cleveland reveal that the city is one of the most important in this field in the entire country.

There are about 95 establishments engaged in the non-ferrous metal foundry, smelting, refining, and manufactured goods industries, with an invested capital of more than $55,000,000. The value of stocks and materials used annually in these plants amounts to about $14,000,000, while the value of products reaches more than $60,000,000.

Among the more important of these firms, some of which are more than 50 years old, are:

Foundries—Advance Bronze & Aluminum Foundry Company, Acme-Palmers & DeMooy Foundry Company, Aetna Brass Manufacturing Company, Albra Casting Company, Breier Brass-Aluminum Foundry Company,



STANDARD BRASS FOUNDRY COMPANY, CLEVELAND, OHIO

City Brass Foundry, Holmes Bronze Foundry, Ideal Bronze Company, National Bronze and Aluminum Foundry Company, Standard Brass Foundry, American Aluminum Match Plate Company and the General Bronze Foundry.

Smelters, refiners and **manufacturers** who have their works or offices in Cleveland are: Atlas Metal Company, Booth Metal Company, Cleveland Copper Company, Cleveland Electro Metals Company, Federal Metal Company, Ohio Smelting Company, River Smelting and Refining Company, Stotter Metal Company, Weiner & Grossman Company, Great Western Smelting & Refining Company, Michigan Smelting & Refining Company, Selker & Pack Metal Company, Paramount Metals Spinning & Stamping Company, National Metal Products Company, Ajax Metal Company, Riester & Thesmacher Company, Roberts Steam Specialty Company, Lewin Metals Corporation, Cincinnati Railway Supply Company, Ohio Aluminum Company, Peerless Metals Company, Buckeye Brass & Manufacturing Company, Betz Pierce Company, and the K. & M. Brass & Aluminum Casting Company.

One of the oldest and perhaps the largest non-ferrous metal foundries in the Cleveland district is that of the National Bronze & Aluminum Foundry Company, an interior view of which is shown. The company, of which J. H. Shafner is general manager, manufactures a wide variety of articles, including brass and aluminum automobile parts, electrical equipment, mining apparatus, washing machine parts, plumbing fixtures and equipment and builders' hardware.

The plant and equipment, valued at more than $1,000,000, is located on a 10-acre tract in the southwest end of the city. One huge building covers more than two and one-half acres. Four hundred men are employed by the company, and the annual value of its finished products exceeds $2,000,000.

General Manager Shafner declares present indications are that his company will be unable to fill all orders on its books during the next three months, so great is the company's business. The market is strong and practically all Cleveland plants are running full force.

In the brass production end of the industry the Glauber Brass Manufacturing Company, with a huge plant on the east side, may easily be considered the largest of its kind in Cleveland, and one of the largest in the entire country. This company confines its activities entirely to the production of plumbing goods. Its activities were described in THE METAL INDUSTRY for September, 1916.

CONVENTION FEATURES

In preparation for the Cleveland convention the papers committee has arranged what promises to be one of the most interesting and well-balanced programs ever held under the auspices of the A. F. A. Following the custom of past years, sessions have been arranged to cover each branch of the foundry industry, and as a special feature, sessions on Molding Sand Research, Apprentice Training, and special developments in the foundry world.

The Institution of British Foundrymen will be represented by a paper on British Foundry Practice, Ferrous and Non-Ferrous, prepared by Dr. Percy Longmuir, which, it is expected, will be one of the real features of the entire convention. The French association, known as the Association Technique de Fonderie de France, will also be represented.

ENTERTAINMENT FEATURES

Many special features have been arranged for visitors by the entertainment committee, and Keith's new $7,000,000 Palace theater has been chartered for Tuesday evening, May 1, for the sole use of the foundrymen and their friends.

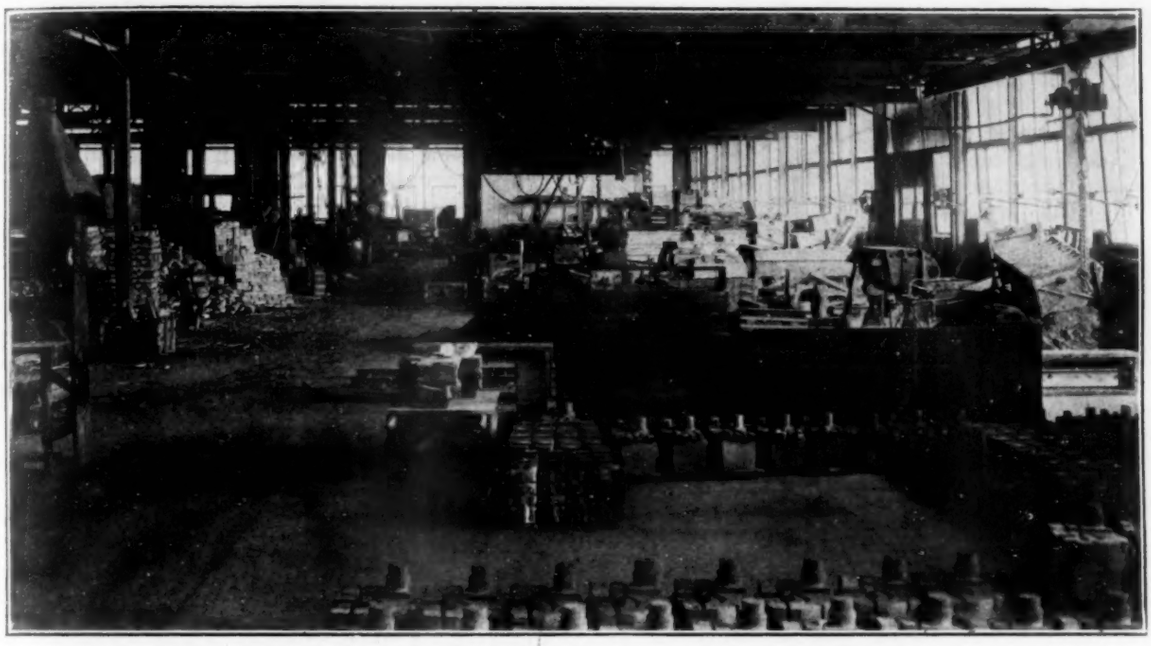
Cleveland's eight municipal golf courses will be reserved for an entire day as another feature for the foundrymen's entertainment, and all who contemplate visiting Cleveland during the convention are urged to take along their golf clubs, shoes and other paraphernalia.

Mayor Fred Kohler and other city officials will assist the local committee in welcoming visitors during the conclave, and no effort will be spared to make every foundryman and his family as comfortable as possible.

The various committees and their chairmen are: Executive, Ralph H. West, West Steel Casting Company; finance, A. O. Backert, 1213 W. 3d street; reception, E. W. Beach, Ferro Machine & Foundry Company; entertainment, J. R. Raible, Fanner Manufacturing Company; plant visitation, C. F. Knowlton, Westinghouse Electric & Manufacturing Company; ladies reception, Mrs. C. W. Sly, 15426 Lake avenue, and publicity, D. M. Avery, Penton Publishing Company.

NEW OFFICERS

The report of the nominating committee, which has been mailed to all members, shows that the following have been unanimously nominated as officers and directors:



NATIONAL BRONZE AND ALUMINUM COMPANY, CLEVELAND, OHIO

For President to serve for one year:

G. H. Clamer, Ajax Metal Company, Phila., Pa.

For Vice-President, to serve one year:

H. B. Swan, Cadillac Motor Car Co., Detroit, Mich.

For Directors to serve three-year terms each:

L. L. Anthes, Anthes Foundry, Ltd., Toronto, Can.

T. S. Hammond, Whiting Corporation, Harvey, Ill.

Alfred E. Howell, Somerville Stove Works, Somerville, N. J.

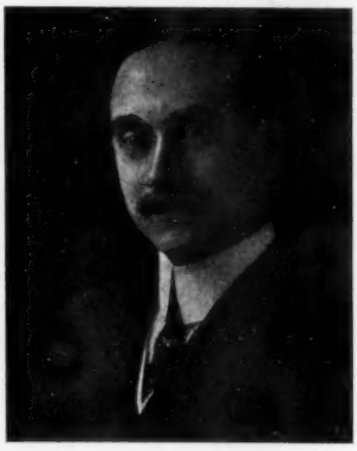
PUBLIC AUDITORIUM, CLEVELAND, OHIO

C. R. Messinger, Chain Belt Co., Milwaukee, Wis.
Thos. W. Pangborn, Pangborn Corporation, Hagerstown, Md.

PROGRAM AND GENERAL ARRANGEMENTS

Attention is called to the fact that the exhibits will be opened on Saturday, April 28, remaining open until 10 p. m. that day. The display will be closed Sunday, but during the remainder of the convention it will be opened daily from 9 a. m. until 5 p. m. Saturday will be known as Cleveland Day for inspection of exhibits.

Each member will receive an identification card entitling the holder to a round-trip railroad rate to the convention at one and one-half the regular one way fare. Additional certificates will be furnished for extra representatives. One of the conditions of granting the special rate is that the certificate must be issued by the secretary of the A. F. A. They cannot be obtained through local ticket agents.



G. H. CLAMER

Foundrymen's Week offers to the foundrymen of America and their friends, and to their guests from foreign countries, the triple attraction of an unusually good technical program, a magnificent exhibit of foundry equipment and supplies, and enjoyable entertainment. The combined card will certainly justify the time and expense of attendance and a cordial invitation is extended to progressive men of the industry in all sections of the country.

Monday, April 30. P. M. Non-Ferrous—Aluminum Alloys.

Linear Construction and Shrinkage of Some Aluminum Alloys—R. J. Anderson, Bureau of Mines, Pittsburgh.

Aluminum and Lighter Alloys—M. de Fleury.

Casting Aluminum Radiator Shells—W. A. Mills, Alloy Foundry and Machine Corporation, New Rochelle, N. Y.

Tuesday, May 1. Non-Ferrous Foundry Practice.

Joint Sessions A. F. A. and Institute of Metals Division A. I. M. E.

Notes on the Proper Pouring and Melting of Brass and Bronze—F. L. Wolf and W. Romanoff.

Present Status of Crucible Making—B. L. Berkey.

Effect of Heat Treatment on Release of Stress in Bronze Castings—R. J. Anderson and C. L. Eldridge.

Casting Bronze Tablets—Jacob G. Kasjens, Brass Foundry Company, Peoria, Ill.

Contraction and Shrinkage of Non-Ferrous Alloys—R. J. Anderson and E. G. Fahlman, Pittsburgh.

P. M. Sand Research—Testing Methods.

Wednesday, May 2. A. M. Sand Research. Reclamation. Conservation and Geological Survey Work.

P. M. New Developments in the Foundry Industry.

Centrifugal Casting—Leon Cammen, New York.

Address by Dr. Percy Longmuir, Institute of British Foundrymen.

Electric Furnaces from the Managers' Standpoint—L. F. Barton, New Orleans.

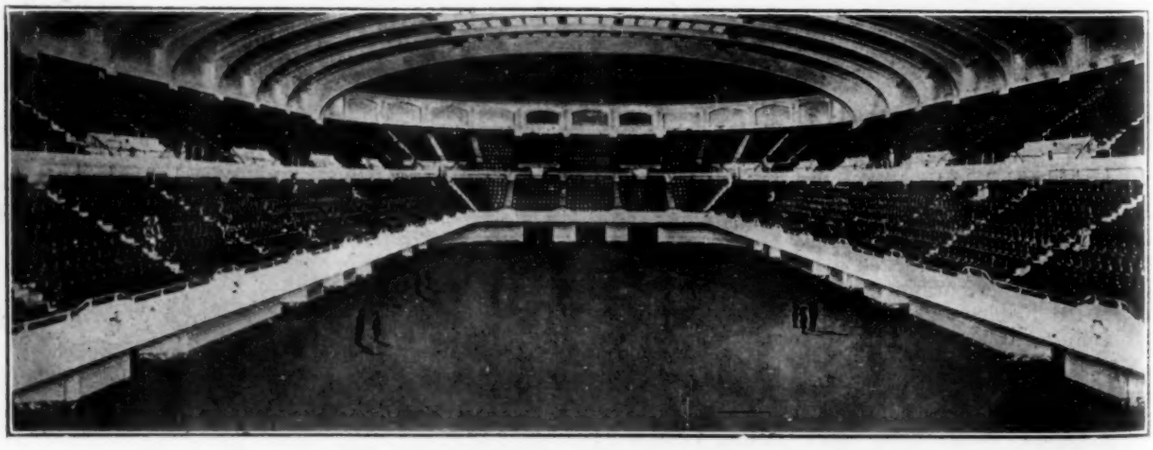
PRIZE COMPETITION FOR FOUNDRY WORKERS

Last year at the Rochester Convention the first Obermayer prize competition was provided for. Provision is being made for a similar contest this year and the cooperation of the members is solicited in making this second contest more valuable and interesting than the first one. To this end it is asked that foundrymen acquaint their superintendents, foremen and workers in their foundry with the conditions and ask them to compete.

CLEVELAND EXHIBITORS

EXHIBITORS LOCATED IN ARENA

Ajax Metal Company, The., Philadelphia, Pa.
Albany Sand & Supply Company, Albany, N. Y.
Asbury Graphite Mills, Asbury, N. J.
Austin Company, Cleveland, Ohio.
Automatic Transportation Company, Buffalo, N. Y.
Bacharach Industrial Instrument Company, Pittsburgh, Pa.
Balbach Smelting & Refining Company, New York, N. Y.
Bartlett & Snow Company, C. O., Cleveland, Ohio.
Bethlehem Steel Company, Bethlehem, Pa.
Birkenstein & Sons, Inc., S., Chicago, Ill.
Black Diamond Saw & Machine Works, Natick, Mass.
Blystone Manufacturing Company, Cambridge Springs, Pa.
Bonnot Company, The, Canton, Ohio.
Brass World Publishing Company, New York, N. Y.
British Aluminium Company, New York, N. Y.
Carborundum Company, Niagara Falls, N. Y.

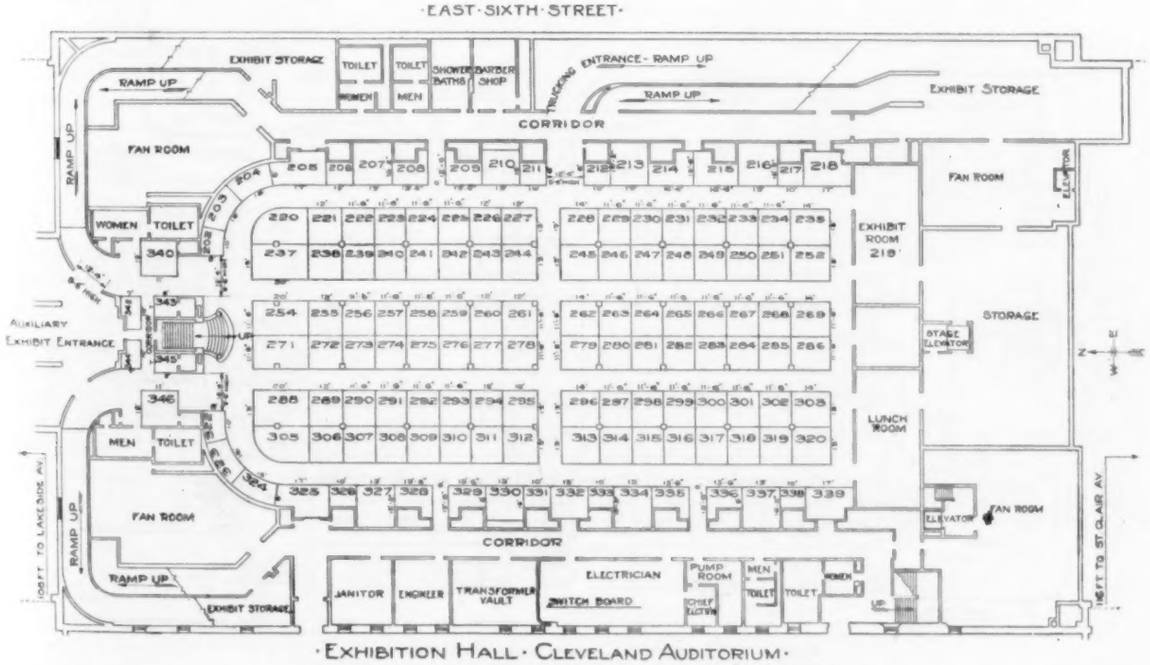


INTERIOR OF PUBLIC AUDITORIUM, CLEVELAND, OHIO

Chase, Inc., Frank D., Chicago, Ill.
Chicago Crucible Company, Chicago, Ill.
Clark Tructractor Company, Buchanan, Mich.
Cleveland Flux Company, Cleveland, Ohio.
Cleveland Wire Spring Company, Cleveland, Ohio.
Coale Lumber Company, Thomas E., Cranford, N. J.
Combined Supply & Equipment Company, Buffalo, N. Y.
Corn Products Refining Company, New York, N. Y.
Dixon Crucible Company, Joseph, Jersey City, N. J.
Dock & Mill Company, North Tonawanda, N. Y.
Doehler Die Casting Company, Brooklyn, N. Y.
Elwell Parker Electric Company, The, Cleveland, Ohio.
Fanner Manufacturing Company, Cleveland, Ohio.
Federal Foundry Supply Company, Cleveland, Ohio.
Foundry Equipment Company, Cleveland, Ohio.
Gallmeyer & Livingston Company, Grand Rapids, Mich.
General Electric Company, Schenectady, N. Y.
Globe Iron-Crush & Shot Company, Mansfield, Ohio.
Great Western Manufacturing Company, Leavenworth, Kans.
Hanna Engineering Works, Chicago, Ill.
Hardinge Company, Inc., New York, N. Y.
Haskins Company, R. G., Chicago, Ill.
Hauck Manufacturing Company, Brooklyn, N. Y.
Hill & Griffith Company, The, Cincinnati, Ohio.
Hillside Fluor Spar Mines, Chicago, Ill.
Holcroft & Company, Detroit, Mich.
Industrial Press, The, New York, N. Y.
Interstate Sand Company, Zanesville, Ohio.
Iron Age, The, New York, N. Y.
Kawin Company, Charles C., Chicago, Ill.
Kellogg & Sons, Inc., Spencer, Buffalo, N. Y.
King Optical Company, Julius, New York, N. Y.
Lakewood Engineering Company, The, Cleveland, Ohio.
Lava Crucible Company of Pittsburgh, Pittsburgh, Pa.
Leeds & Northrup Company, Chicago, Ill.
Link Belt Company, Chicago, Ill.
Lupton's Sons Company, David, Philadelphia, Pa.
McArthur, C. E., Chicago, Ill.
McCormick Company, J. S., Pittsburgh, Pa.
McLain's System, Milwaukee, Wis.
Maclean Publishing Company, Toronto, Canada.
Menefee Foundry Company, Fort Wayne, Ind.
Metal Industry, New York, N. Y.
Metal & Thermit Corporation, New York, N. Y.
Michigan Smelting & Refining Company, Detroit, Mich.
Monarch Engineering & Manufacturing Company, Baltimore, Md.
Norma Company of America, Long Island City, N. Y.
Norton Company, Worcester, Mass.
Obermayer Company, The S., Chicago, Ill.
Paxson Company, J. W., Philadelphia, Pa.
Peerless Sand Company, Conneaut, Ohio.
Penton Publishing Company, Cleveland, Ohio.
Pickands, Brown & Company, Chicago, Ill.
Pittsburgh Electric Furnace Corporation, Pittsburgh, Pa.
Porcelain Enamel & Manufacturing Company, The, Baltimore, Md.
Portage Silica Company, Youngstown, Ohio.
Quigley Furnace Specialties Company, New York, N. Y.
Racine Tool & Machine Company, Racine, Wis.
Richards-Wilcox Manufacturing Company, Aurora, Ill.
Robeson Process Company, New York, N. Y.
Rogers, Brown & Company, Cincinnati, Ohio.
Roots Company, P. H. and F. M., Connersville, Ind.
Safety Equipment Service Company, Cleveland, Ohio.
Simonds Saw & Steel Company, Fitchburg, Mass.
Sly Manufacturing Company, The W. W., Cleveland, Ohio.
Smith Facing & Supply Company, The, Cleveland, Ohio.
Smith Company, The Werner G., Cleveland, Ohio.
Sterling Wheelbarrow Company, Milwaukee, Wis.
Strand & Company, N. A., Chicago, Ill.
Superior Sand Company, Cleveland, Ohio.
Thompson Company, Warner R., Detroit, Mich.
United Compound Company, Buffalo, N. Y.
United States Graphite Company, The, Saginaw, Mich.
United States Silica Company, Chicago, Ill.
Wadsworth Core Machine & Equipment Company, Akron, Ohio.
Waldo, Egbert & McClain, Inc., Buffalo, N. Y.
Wallace & Company, J. D., Chicago, Ill.
White & Brother, Inc., Philadelphia, Pa.
Whitehead Bros. Company, Buffalo, N. Y.

EXHIBITORS LOCATED ON THE ARENA STAGE

American Hominy Company, Chicago, Ill.
Chisholm-Moore Manufacturing Company, The, Cleveland, Ohio.
Electro Refractories Company, Buffalo, N. Y.
King Refractories Company, Inc., Buffalo, N. Y.
Louden Machinery Company, Fairfield, Iowa.
National Scale Corporation, Chicopee Falls, Mass.
Skybryte Company, The, Cleveland, Ohio.



EXHIBITION HALL · CLEVELAND AUDITORIUM ·

DIAGRAM OF EXHIBITION HALL, CLEVELAND, OHIO

Springfield Aluminum Plate & Castings Company, Springfield, Ohio.
Springfield Facing Company, Springfield, Mass.
Stamp Electric Hoist Company, Cleveland, Ohio.
Stevens, Inc., Frederic B., Detroit, Mich.
Taylor Instrument Companies, Rochester, N. Y.

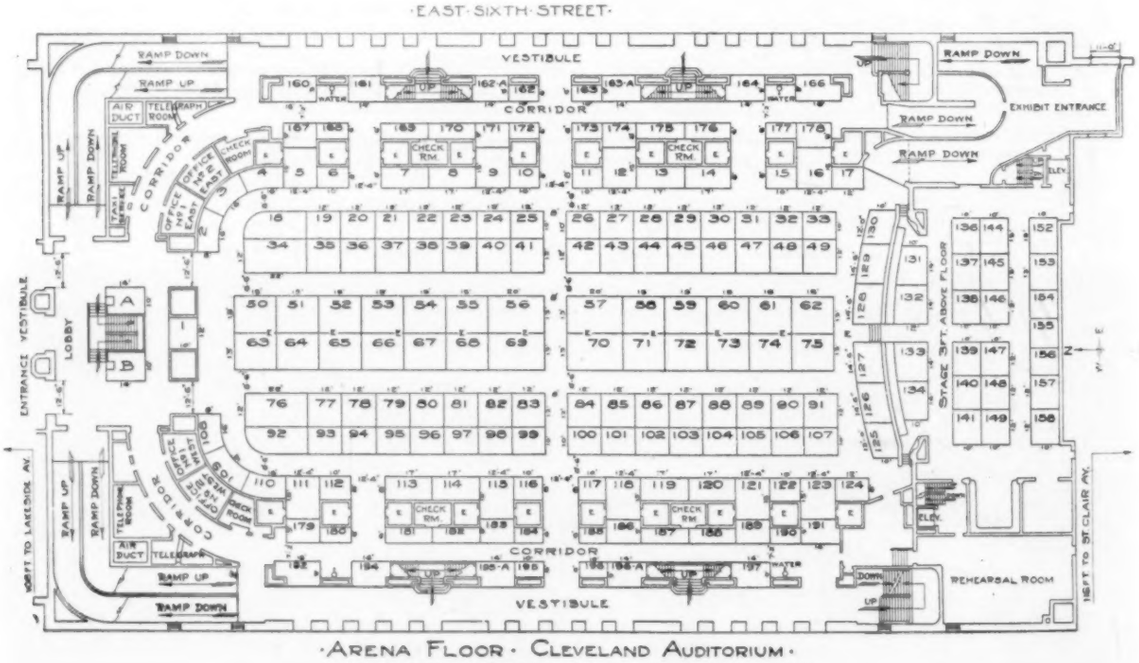
EXHIBITORS LOCATED IN CORRIDORS OF THE ARENA

Arex Company, Chicago, Ill.
Bradley Wash Fountain Company, Milwaukee, Wis.
Carter Bloxonend Flooring Company, Cleveland, Ohio.
Cleveland Armature Works, Cleveland, Ohio.
Cleveland Blow Pipe & Manufacturing Company, Cleveland, Ohio.
Cleveland Steel Tool Company, The, Cleveland, Ohio.
Cleveland Vibrator Company, Cleveland, Ohio.
Disston & Sons, Inc., Henry, Philadelphia, Pa.
Gordon, Inc., Robert, Chicago, Ill.
Jones Sand Company, Columbus, Ohio.
Knefler-Bates Manufacturing Company, Indianapolis, Ind.
Lane Company, H. M., Detroit, Mich.
Lewis-Shepard Company, Boston, Mass.
Marschke Manufacturing Company, Indianapolis, Ind.
Medart Company, The, St. Louis, Mo.
Northern Blower Company, Cleveland, Ohio.
Peffer Oil Company, Wilkes-Barre, Pa.
Sabin Machine Company, Cleveland, Ohio.
Safety First Shoe Company, Providence, R. I.
Wyoming Shovel Works, Wyoming, Pa.
Zanesville Sand Company, Zanesville, Ohio.

EXHIBITORS LOCATED IN EXHIBITION HALL

Air Reduction Sales Company, New York, N. Y.
American Foundry Equipment Company, New York, N. Y.
Arcade Manufacturing Company, Freeport, Ill.
Armstrong-Blum Manufacturing Company, Chicago, Ill.
Arrow Tools, Inc., Chicago, Ill.
Atkins & Company, E. C., Indianapolis, Ind.
Beardsley & Piper Company, Chicago, Ill.
Berkshire Manufacturing Company, Cleveland, Ohio.
Bridgeport Safety Emery Wheel Company, Bridgeport, Conn.
Buckeye Products Company, The, Cincinnati, Ohio.
Campbell-Hausfeld Company, The, Harrison, Ohio.
Chicago Pneumatic Tool Company, New York, N. Y.
Cleveland Electric Tramrail, Wickliffe, Ohio.
Cleveland Pneumatic Tool Company, Cleveland, Ohio.
Coleman Company, The F. A., Cleveland, Ohio.
Davenport Machine & Foundry Company, Davenport, Iowa.
Dayton Pneumatic Tool Company, The, Dayton, Ohio.
Demmler & Bros., Wm., Kewanee, Ill.
Detroit Electric Furnace Company, Detroit, Mich.
Electric Welding Machine Company, Detroit, Mich.
Federal Malleable Company, West Allis, Wis.
Grimes Molding Machine Company, Detroit, Mich.
Hayward Company, New York, N. Y.
Herman Pneumatic Machine Company, Pittsburgh, Pa.
Hoevel Manufacturing Corporation, Jersey City, N. J.
Independent Pneumatic Tool Company, Chicago, Ill.
Ingersoll-Rand Company, New York, N. Y.
International Molding Machine Company, Chicago, Ill.
Johnston & Jennings Company, The, Cleveland, Ohio.
Keller Mechanical Engraving Corporation, Brooklyn, N. Y.
Macleod Company, The, Cincinnati, Ohio.
Malleable Iron Fittings Company, Branford, Conn.
National Engineering Company, Chicago, Ill.
New Haven Sand Blast Company, The, New Haven, Conn.
Nicholls Company, Inc., Wm. H., Brooklyn, N. Y.
Oldham & Son Company, George, Baltimore, Md.
Oliver Machinery Company, Grand Rapids, Mich.
Osborn Manufacturing Company, Cleveland, Ohio.
Oxweld Acetylene Company, Chicago, Ill.
Pangborn Corporation, Hagerstown, Md.
Pridmore, Henry E., Chicago, Ill.
Roto Pneumatic Company, The, Cleveland, Ohio.
Royer Foundry & Machine Company, The, Wilkes-Barre, Pa.
Shepard Electric Crane & Hoist Company, Montour Falls, N. Y.
Spencer Turbine Company, The, Hartford, Conn.
Standard Equipment Company, New Haven, Conn.
Standard Sand & Machine Company, The, Cleveland, Ohio.
Sullivan Machinery Company, Chicago, Ill.
Super Arc Welding Machine Company, Detroit, Mich.
Teetor Company, R. J., Cadillac, Mich.
Truscon Steel Company, Youngstown, Ohio.
Wadsworth, H. L., Cleveland, Ohio.
Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.
Westinghouse Traction Brake Company, Pittsburgh, Pa.
Whiting Corporation, Harvey, Ill.
Woodison Company, E. J., Detroit, Mich.
Young Bros. Company, Detroit, Mich.

Descriptions of some of the exhibits are given on page 167 of this issue.



ARENA FLOOR · CLEVELAND AUDITORIUM ·

DIAGRAM OF ARENA FLOOR, CLEVELAND, OHIO

A List of Alloys

Reprinted from the Booklet Published by the American Society for Testing Materials. Part 2*

By WILLIAM CAMPBELL†

CHEMICAL SYMBOLS APPEARING IN LIST

The following is a list of the metals which enter into the alloys covered in the List together with the corresponding chemical symbol. Only the symbols appear in the List of Alloys.

Aluminum	Al
Antimony	Sb
Arsenic	As
Barium	Ba
Bismuth	Bi
Boron	B
Cadmium	Cd
Calcium	Ca
Carbon	C
Chromium	Cr
Cobalt	Co
Copper	Cu
Gold	Au
Iridium	Ir
Iron	Fe
Lead	Pb
Magnesium	Mg
Manganese	Mn
Mercury	Hg
Molybdenum	Mo
Nickel	Ni
Palladium	Pd
Phosphorus	P
Platinum	Pt
Rhodium	Rh
Silicon	Si
Silver	Ag
Sodium	Na
Tin	Sn
Titanium	Ti
Tungsten	W
Vanadium	V
Zinc	Zn

BRASSES

	COPPER Cu	ZINC Zn	TIN Sn	LEAD Pb	IRON Fe	OTHER ELEMENTS
Admiralty, A	70.	29.	1.	....	....	
Aitch Metal	60.	38.2	....	....	1.5	
Aluminum Brass	63.	33.3	....	....	....	Al, 3.3; Si, 0.3
Anvil Brass	62.50	37.50	....	....	....	
Arko	80.	20.	....	....	....	
Augsburg	71.9	27.6	....	....	....	
Austrian Journal Box	92.5	7.5	....	....	....	
Bath Metal	55.	45.	....	....	....	
Bath Metal	83.	17.	....	....	....	
Battery Copper	94.00	6.00	....	....	....	
Bell Brass	64.25	35.00	0.75	....	....	
Belt Lace	62.00	38.00	....	....	....	
Best Bronze	90.00	10.00	....	....	....	
Binding Brass	63.25	35.00	....	1.75	....	
Birmingham Platina	46.6	53.15	....	....	0.25	
Bismuth Brass	47.	21.	1.	....	....	Ni, 30.9; Bi, 0.1
Blatt Gold	77.	23.	....	....	....	
Block Brass	66.50	32.00	....	1.50	....	
Bobierre Metal	66.	34.	....	....	....	
Bobierre Metal	58.2	41.7	....	....	....	
Bow Wire	93.00	2.00	5.00	....	....	
Brazing Metal, F	85.	15.	....	....	....	
Brazing Brass	75.00	25.00	....	....	....	
Bright Cap Gilding	89.75	9.87	....	0.38	....	
Bristol	75.7	24.3	....	....	....	
Bristol	67.2	32.8	....	....	....	
Bristol	60.8	39.2	....	....	....	
Bronze Powder	84.00	16.0	....	....	....	
Brush Wire	64.25	35.	0.75	....	....	
Buckle Brass	65.00	35.	....	....	....	
Bullet Brass	90.	9.	....	1.	....	
Burr Brass	62.00	38.00	....	....	....	
Burr Metal	90.00	10.00	....	....	....	
Butt Brass	65.50	33.50	....	1.	....	
Butt Brass	63.50	35.50	....	1.	....	
Button Brass	89.50	10.00	0.50	....	....	
Button Metal	43.	57.	....	....	....	
Button Metal, Ludensheidt	20.	80.	....	....	....	
Buttons (Thurston):						
Bristol Alloy	57.9	36.8	5.3	....	....	

*This booklet can be obtained from THE METAL INDUSTRY for $1 Part 1 appeared in our issue of March, 1923.

†Professor of Metallurgy, School of Mines, Columbia University, New York.

	COPPER Cu	ZINC Zn	TIN Sn	LEAD Pb	IRON Fe	OTHER ELEMENTS
Bristol Alloy	61.12	36.11	2.77	....	....	
Jackson's Alloy	63.88	30.55	5.55	....	....	
Jackson's Alloy	63.01	35.61	1.39	....	....	
"Bidery"	48.50	33.32	6.06	12.15	....	
"Gold"	58.71	33.03	5.70	2.75	....	
Cap Gilding	90.00	10.00	....	....	....	
Cartridge Brass	66.67	33.33	....	....	....	
Cartridge Brass	68.00	32.00	....	....	....	
Cartridge Brass	70.00	30.00	....	....	....	
Cartridge Gilding	93.00	7.00	....	....	....	
Chamet Bronze	62.	38.	....	....	....	
Check Brass	62.	38.	....	....	....	
Chrysokalk	90.5	7.9	....	1.6	....	
Chrysokalk	58.7	40.2	....	1.1	....	
Chrysorin	72.	28.	....	....	....	
Chrysorin	66.7	33.3	....	....	....	
Chrysorin	63.3	36.7	....	....	....	
Clinching Screw Wire	69.	29.50	....	1.50	....	
Clock Brass	62.50	35.75	....	1.75	....	
Collet Brass	61.00	36.50	....	2.50	....	
Commercial Bronze	90.00	10.00	....	....	....	
Commercial Brass, B-r	63.	37.	....	....	....	
Commercial Castings, B-c	62.	30.	6.	2.	....	
Common Brass	65.	35.	....	....	....	
Cuivre Poli	70.	30.	....	....	....	
Cymbal Metal	78.	22.	....	....	....	
Delatot's Metal	80.	18.	....	....	....	Mn, 2.0
Delta Metal	55.1	43.5	....	0.37	1.08	P, 0.1
Delta Krupp	55.94	41.61	....	0.72	0.87	Mn, 0.81; P, 0.013
Delta Krupp	55.8	40.07	....	1.82	1.28	Mn, 0.96
Delta Krupp	55.82	41.41	....	0.76	0.86	Mn, 1.38
Delta Krupp	54.22	42.25	....	1.10	0.99	Mn, 1.09
Diaphragm Brass	95.00	2.00	3.	....	....	
Dipping Brass	66.66	33.34	....	....	....	
Door Plate Brass	65.	35.	....	....	....	
Door Plate Brass	63.	35.	....	2.00	....	
Doctor Metal	88.	9.50	2.50	....	....	
Drawing Brass, Deep	70.	30.	....	....	....	
Drawing Brass	66.67	33.33	....	....	....	
Drill Rod	62.	35.50	....	2.50	....	
Durana	65.	30.	2.	....	1.5	Al, 1.5
Dutch Metal	76.	24.	....	....	....	
Electrical Brass Castings, B. E.	84.	13.	3.	....	....	
English	70.3	29.3	0.17	0.26	....	
Engravers' Brass	66.	33.	....	1.00	....	
Escutcheon Pin Brass	64.50	35.07	....	0.43	....	
Eyelet Brass	68.	32.	....	....	....	
Eyelet Brass	65.	35.	....	....	....	
Fan Blades	61.50	37.00	....	1.50	....	
Flush Plate	65.75	32.75	....	1.50	....	
Fob Metal	87.50	12.00	0.50	....	....	
Forbes Metal (Buttons)	46.5	53.5	....	....	....	
Forgings	60.	40.	....	....	....	
Forgings	57.	43.	....	....	....	
Forgings, Russian	53.5	42.	....	....	....	Mn, 4.5
Fourdrinier Wire	84.63	15.	0.37	....	....	
Fourdrinier Wire	80.	20.	....	....	....	
Free Cutting Bronze	88.50	10.00	....	1.50	....	
Gedges Metal	60.	38.5	....	....	1.5	
Gold Leaf Metal	84.	16.	....	....	....	
Gold Leaf	66–80	34–20	....	....	....	
Gold Leaf Jemmapes	64.6	33.7	1.4	0.2	....	
Gold Leaf Aix	64.8	32.8	2.0	0.4	....	
Gong Metal	78.	22.	....	....	....	
Grommet Brass	70.	30.	....	....	....	
Guettier's Button	56.	44.	....	....	....	
Guettier's Button	61.5	32.	6.5	....	....	
Guettier's Button	61.4	28.9	9.7	....	....	

This list will be continued in an early issue.—Ed.

Electric Brass Furnace Practice

A Review of Bureau of Mines Bulletin 202 on Electric Brass Furnace Practice by H. W. Gillett and E. L. Mack

Written for The Metal Industry by ADOLPH BREGMAN, Managing Editor

As a part of its work of furthering the progress of the electric brass furnace, the Bureau of Mines issued recently Bulletin 202 on Electric Brass Furnace Practice by H. W. Gillett and E. L. Mack. This Bulletin was reviewed briefly in our January issue (page 26) but no short summary (which was all that space permitted at that time), does justice to this work. Because the interests of the readers of THE METAL INDUSTRY are so directly concerned, and also the fact that we have published so much on electric brass furnaces, the writer proposes to go over the volume in detail.

The book lists the electric furnaces in active commercial use or being installed for non-ferrous alloys in the United States, on January 1, 1922. Summarized briefly, these lists show the following facts.

MOST SUCCESSFUL FURNACES

By far the most popular types in use are the moving indirect arc furnace, the reflected heat furnace (or as it is sometimes called, resistance furnace) and the vertical ring induction furnace. The outstanding makes, representing these three types are respectively the Detroit and Booth, the Baily and the Ajax-Wyatt. The following table shows their relative position on the above date:

MAKE	NUMBER OF FURNACES	TOTAL CAPACITY PER HEAT TONS	TOTAL KILOWATTS
Ajax-Wyatt	176	84.3	14,085
Detroit	60	54.4	16,325
Baily	83	51.7	7,455
Booth	40±	13.2	5,345
Other furnaces	54	30.1	7,661
	413	233.7	50,861

ELECTRIC PRINCIPLES

An excellent chapter on the Terminology and Fundamental Electric Principles of Electric Furnaces is included, which should be of great value to every foundryman and metallurgist. Comparatively few metallurgists are also electric engineers, and such a clear explanation of these electrical fundamentals as applied directly to the work at hand cannot but meet a real need.

RELIABILITY

From the standpoint of engineering, the authors make an excellent point when they state:

"The furnace must be reliable and must stand up to its work day after day. St. John, in discussing this subject, has well expressed the situation when he says 'sustained mediocrity is preferable to intermittent perfection.'"

The furnace must be rugged. Delicate, or as the authors say "fussy" arrangement, especially where they are placed near heated interior or tap hole, they are likely to result in failure. Linings must be simply and easily replaceable.

BAILY REFLECTED HEAT FURNACE

The standard 105-kw. Baily furnace will melt 2:1 yellow brass with 400 k.w.h. per ton, 50 cents per ton upkeep, and 1 per cent net metal loss, with careful operation at 16 hours per day and first rate handling. Working conditions are good, also reliability and refractory life. The furnace can handle all sorts of alloys built high and low in zinc.

Disadvantages are, a not very high rate of production, difficulty of close temperature control, difficulty of thorough mixing as compared with other types, and comparatively high power consumption.

GENERAL ELECTRIC REFLECTED (HEAT FURNACE)

The General Electric furnace is good so far as its electrical characteristics, the rate of production, and metal losses are concerned. Thermally, it is inefficient and the life of the refractories is short.

STATIONARY INDIRECT ARC FURNACES

There is a summary on stationary indirect arc furnaces which is very useful even though this type of furnace has made no great inroads into the brass industry. The authors state that they are wasteful of zinc if used on zinc mixtures, even though "in the United States an alloy of about 20 per cent zinc has been commercially melted in a 600-pound furnace with a metal loss slightly less than in former fuel fired practice." Trouble was experienced due to electrodes sticking from condensed zinc and difficulty was also experienced in keeping furnaces of sizes of one ton upward tight enough to reduce metal losses.

It is stated that stationary indirect arc furnaces, such as the Rennerfelt, or the Von Schlegell repelling arc, are useful for Monel metal, cupro-nickel, pure copper, silver, bronze, red brass and similar alloys containing up to 10 per cent zinc or 15 per cent lead. They are quite reliable; have a reasonable cost of upkeep and rate of production, not quite so large as that of the direct arc type, but better than the reflected heat furnaces.

VERTICAL RING INDUCTION FURNACE

The Ajax-Wyatt furnace, the leading vertical ring induction furnace, is summarized as follows:

The Ajax-Wyatt furnace is satisfactory as regards its electrical characteristics and makes a satisfactory load on the power line. It is compact, has a very low metal loss even on alloys high in zinc and is thermally the most efficient brass furnace known, on 24-hour operation. It mixes the metal perfectly. It is very reliable and the lining cost per ton is low. Its disadvantages are: (1) that it must be operated 24 hours a day or else kept hot overnight by keeping the metal in the resistor-loop melted; (2) if it must be shut down, it is necessary to drain it and then preheat with an oil or gas flame before starting again. It is, therefore, inflexible as regards changing the type of charge. It is not built for alloys very high in copper or lead. "In general the furnace is worthy of careful consideration by any rolling mill, and so far it holds first place in actual achievement in that class of work.

THE GENERAL ELECTRIC INDUCTION FURNACE

The General Electric Company has placed on the market an induction furnace which was described in THE METAL INDUSTRY for August, 1922. It is claimed that this furnace will melt with a power consumption of 200 k.w.h. per ton of brass with a metal loss of less than 1 per cent.

AJAX-NORTHRUP FURNACE

The Ajax-Northrup is an induction furnace using a high frequency current inside of the ordinary alternating current. It is free from the limitations of the Ajax-Wyatt

since it has no secondary loop and can, therefore handle any metal. Moreover, it does not have to be kept hot overnight. It is stated that this furnace because of its combination of efficiency and flexibility is one of the most promising of all for ultimate use. Its present field seems to be in the laboratory and in commercial melting of precious metals.

APPLICABILITY OF VARIOUS TYPES TO VARIOUS MIXTURES

Viewed from the standpoint of applicability, tables are given as a general sort of guide on which to base judgment. These tables were published in an earlier Bulletin of the Bureau of Mines and reprinted in THE METAL INDUSTRY for June, 1921.

REFRACTORIES

The problem of refractories has been one of the greatest difficulties to overcome. So far as settling it is concerned, this is, of course, the business of the furnace manufacturer. However, the matter is so vital to the furnace user that in many cases, he has actively co-operated with the manufacturer in this work. Ultimately the responsibility rests on the user because after the first lining wears out he must decide where to go for replacements. To get a combination of long life and good heat insulation is, of course, difficult to obtain.

Most furnaces use two layers of refractory material. The outside layer is generally infusorial earth or asbestos cement of some kind. The middle layer is a low grade of fire brick. The inner layer is the place where all the difficulty occurs and the following refractories have been used: high-grade fire brick (high in alumina) is the most common. Silica brick is also used. In addition the following refractories have been tried: magnesite, carborundum, chromite, zirkite, alundum.

TESTING ELECTRIC FURNACES

The matter of testing electric furnaces is taken up and they have pointed out rightly that it is as necessary to test an electric furnace thoroughly and fairly, as it is to test a boiler in that fashion. During the last few years, volumes of figures have been published on furnace "tests" and comparative furnace operations. How much of this data is really valuable is impossible to say, but it is certain that a large part of it has been obtained under conditions which are not controlled and therefore, produced results which could not be checked against others.

TWO-STAGE MELTING

It is stated that a suggestion has been made to melt brass in two stages, namely by pre-heating the metal with fuel and then transferring it to the electric furnace for melting. From the point of view of thermal efficiency, this would perhaps be advantageous but from the standpoint of practical operations, it would be very difficult mechanically. Possibly, the heat units used would be fewer and consequently the direct melting cost lower, but the additional cost of handling, the overhead cost of the added equipment and the possibility of mishaps and failure to synchronize the operations of the pre-heating furnaces with the melting furnaces could very easily wipe out such savings.

CONSIDERATIONS BEFORE INSTALLATION

In considering the advisability of installing electric furnaces, the question at once divides itself into the following classifications:

1. Have electric brass furnaces proved successful from an engineering standpoint; that is, can they be built and operated so as to conform with the present day factory and power conditions?
2. Have electric furnaces proved metallurgically practicable? In other words, have they been able to melt metals and to turn out materials of a grade high enough to be marketable?
3. Are electric furnaces practical from the standpoint of the operator and worker? In other words, is it possible to run them without ill effects on the operating forces?
4. Are they commercially practicable? Can they turn out metal at a price to compete with the material produced by crucibles, open-flame and reverberatory furnaces?

The answer to the first three questions is unquestionably and without qualification, yes. Although at one time there was some difficulty about the desirability of electric furnaces, to the power companies, this is no longer a serious question. The whole matter resolves itself then into one of costs. Now cost determination and comparison with melting by fuel it not easy. An unusual number of variables must be considered.

1. The tonnage of metal melted.
2. Weight of metal per heat.
3. Variety of mixtures made.
4. Form of final product, that is whether large or small pieces.
5. Cost of power in the district.
6. Cost of various kinds of fuel in the district.
7. Cost of labor.

Added to these must come the overhead and fixed charges on an expensive installation.

It is impossible to make a general statement based on any one set of figures simply because each particular case is a law unto itself.

N. K. B. Patch states that the cost of metal melted, the melting loss and the solution to cast any metal are specifically the same in electric furnaces and fuel fired furnaces providing intelligent operation is pursued.*

W. J. Reardon in THE METAL INDUSTRY for May, 1920, states that the cost of melting in the coke pit furnace was twice as much as melting in the Schwartz furnace, and that the electric furnace melting cost was 30 per cent higher than that of the Schwartz.

The writer has heard a number of statements at meetings of the Institute of Metals Division to the effect that melting by the electric furnace operation is much cheaper. It is plain from the variety of statistics published that each case must be determined for itself.

SAVINGS MADE BY ELECTRIC FURNACES

Let us first take up the savings pointed out. The authors state that in 1917 metal losses amounted to about 28,500,000 pounds, mostly zinc. Figures are also given in dollars but prices at that time were so far out of line with their present position that comparison is hardly worth while. Also, losses during that year were considerably higher than normal cost because of the rush of war production. It is impossible to estimate accurately how much money would be saved in metal losses, but it seems likely that their figures for 1919 are reasonable. In these are given a consumption of 800,000,000 pounds of brass and bronze. Assuming copper at 19½, as it was during that year, and zinc at 8, and assuming that electric furnaces would save 1½ per cent of what was lost at that time (this figure arrived at probably by subtracting ½ per cent, the unavoidable loss, from 2 per cent the total loss) the preventable loss amounted to around 1,400,000. Adding to this the saving by eliminating the need of slag and ash treatment, the saving in crucibles and possibly fuel and labor, the authors estimate that under peace time con-

*Comparison of Electric Furnace Practice With Fuel Fired Practice, read at the Symposium on Non-Ferrous Metallurgy at the 40th General Meeting of the American Electrochemical Society, held at Lake Placid, September 29-October 1, 1921, THE METAL INDUSTRY, November, 1921.

ditions between two and three million dollars can be saved. This may be somewhat high, due to the high figures for copper losses assumed, one-third of total loss), but it is not unacceptable.

The authors also point out quite justly that there are savings, due to better working conditions, cleaner plants and absence of zinc fumes and their attendent "brass shakes."

COST OF ELECTRIC FURNACE OPERATION

Now for the other side. It must be remembered in the first place that the electric furnace is a very expensive piece of machinery. To be sure it is very efficient but the savings made by this efficiency cannot be counted as free and clear. The authors point out that the first cost of the electric furnace must not be forgotton. An interest and depreciation charge should be added to every pound of metal melted. It is needless to point out that time spent idle is extremely expensive. An electric furnace must work steadily in orded to be economical.

Cheap power must be available. It is very doubtful if, under most conditions, an electric furnace could be operated economically at more than 2½ cents per kilowatt hour. In those localities where power is more expensive, production would have to be extraordinarily large to effect all other possible economies before electric melting could be attempted. Furthermore, there are additional balancing considerations. If power costs are high and labor low it is better to use a very efficient furnace which will keep down the power bills and use a little more labor. If power is low, such a furnace is not a necessity. The cost of refractories in running a furnace under high pressure to get maximum output, must also be considered.

The authors themselves state that not every foundry is so situated that electric melting is cheaper than melting by fuel. Neither electric furnaces in general, nor (still less) any particular type or make of electric furnace, can be advocated as a panacea for all non-ferrous melting problems. It is encouraging, however, to read that the central power station is generally glad to co-operate with the foundry and to aid in the selection of a suitable furnace and its proper installation.

An interesting point is that it is possible to obtain a lower rate by buying power at any time except the two or three hours when the power house is carrying its heaviest load. This would call for a special arrangement of melting hours in the foundry, which might or might not be possible.

ASPECT OF NATIONAL CONSERVATION

The authors take up the problem also in a very broad manner under the subject of national conservation. Large metal savings can be made, crucibles can be saved, health and labor saved, and fuels (such as coal, burned in the power plant), substituted for oil, which, it is common knowledge, is a rapidly wasting asset. In addition to this, of course, there is the fact that hydro-electric power takes no fuel at all. Moreover, it is stated that if the power is generated either from coal through a steam boiler and turbo-generator, or through a gas producer and gas engine from gas-tar through a Diesel type engine and generator in a reasonably efficient large central power plant, the efficiency of certain types of electric furnaces is so good that electric melting might require fewer B.t.u. in power plant fuel than would be needed for melting in fuel fired furnaces. This statement, of course, is subject to nimberless conditions and is therefore quite properly made with many possible reservations. Nevertheless, in view of the known low thermal efficiency of fuel fired furnaces it seems altogether probable that in many cases such a condition would be the case.

In viewing the cost question in a broad way, however, it must not be lost sight of that the brass industry is composed of a large number of very small units and a small number of large ones. According to the last United States census of brass, bronze and copper products there were 1,092 such establishments in the United States, employing 73,051 workers.*

One thousand thirty-nine establishments employ from 250 workers down, thus showing that the industry includes a large number of medium to small plants. The problem immediately changes its aspect. It is no longer a question whether a large investment in a number of furnaces will show a reasonable or even a good return. As a matter of fact that problem has already been settled. The great brass and copper plants throughout the country have gone over to a great extent to electric melting furnaces. But for the small plant the question is still one to be thrashed out in every single individual case. It should be perfectly clear that a mere statement of the amount of metal which can be saved and the amount of fuel which can be saved does not answer the question of the availability of electric furnaces for use in the brass industry. Considered even from a general, broad viewpoint, it must be remembered that the brass industry is made up of a large number of comparatively small units and it must be considered as such. If the fixed charges on an expensive installation and the high power cost on a comparatively small capacity overbalance the savings, due to metal recovery, even the national aspect of fuel saving should not lead the individual foundryman into burdening himself. The "broad" view of the foundry industry consists of a summation of all the individuals and we say, advisedly, especially the small to medium sized plants. When the electric furnace becomes commercially feasible for them, the brass industry will open all its doors wide to the electric furnace.

There is no question that the makers of electric furnaces realize this condition. As a class they have been unusually conservative in their claims. Moreover, there seems to be a tendency toward working for smaller furnaces which will cost less and be more flexible in changing from one alloy to another. This is a step in the right direction. One of the most serious objections to the large electric furnace made by foundrymen is its lack of flexibility.

When Messrs. Gillett and Mack state, as they do, that "it does seem certain that in the great majority of cases the electric melting of brass is both the best and the cheapest method," it is the writer's impression that the term "in the great majority of cases" should be changed to "for the larger part of the tonnage." It is very doubtful if it is true at the present time of a real numerical majority of the brass plants in the country.

Nevertheless, one may agree with the authors in their closing statement that the electric furnace by sheer superiority of service, must be ultimately destined for a dominant place in brass melting. To this statement one may subscribe and at the same time also believe in the continued existence of crucibles and open flame furnaces for use for which they will always be best suited.

A very fair and clean-cut summary of the electric brass furnace concludes the book. No better statement can be made than to quote it in full:

"There are some points on which the path of progress of electric brass furnaces is fairly clear. Mechanical refinements, use of automatic electrode control in batteries of arc furnaces and a slow but general improvement in life of refractories may be looked for as experience is gained. There are, however, many points of in-

*It is estimated that there are, in all, between 4,000 and 5,000 metal foundries, many of which are departments of manufacturing plants and general foundries.

terest on which there is not yet enough collected experience to allow prediction.

"The electric furnace has not yet displaced the fuel-fired furnace from the field, nor will it do so completely in the near future, if ever. But it does seem certain that in the great majority of cases the electric melting of brass is both the best and the cheapest method, and that electric furnaces, by their sheer superiority of service, must be destined for a dominant place in brass melting."

Everyone connected in any way with the brass industry should have a copy of Bureau of Mines Bulletin 202. It is a landmark.

Dial Copper and 12% Watch Nickel

Description of the Manufacture of These Products from the Raw Material to the Finished Product—Conclusion*

By WILLIAM B. PRICE, Chief Chemist and Metallurgist, Scovill Manufacturing Company, Waterbury, Conn.

BREAKING DOWN AND STRAIGHTENING

The annealed bars are now reduced in several passes through the breaking down rolls. This process rolls out and levels off the inequalities in the surface of the cast bar, and breaks down the metal to the desired thickness.

The bars are now straightened by being passed through a series of rolls.

OVERHAULING

The straightened bars are then overhauled by being put through a milling machine, which planes both sides of the bar, and thus removes mechanical defects and surface impurities from the bar. Any small pits or dirt spots not eliminated by this operation are removed by hand overhauling. The bars are now ready for another anneal.

The annealed and milled bars are then passed through the breaking down rolls again and still further reduced.

ANNEALING

Mechanical working of watch nickel hardens the metal, so it is necessary to anneal it between the various stages of the rolling process, in order to relieve rolling strains and soften the material.

The bars are loaded on iron pans and by mechanical means the charge is drawn into the annealing muffle.

In the process of annealing the bars become coated with oxide of copper, nickel, and zinc, and these are removed by pickling in a dilute solution of sulphuric acid.

The bars are then washed in water and then passed through the running down rolls.

From this point on the metal passes through, alternating, rolling, annealing, pickling and washing operations until it is finally finished to the desired gauge on the finishing rolls. See Figure 16.

BLANKING

The finished bars are cut into desired lengths and then blanked out on a single punch machine into the proper shaped watch blanks. The operation is shown in Figure 17. The blanks are then inspected for mechanical defects, packed and shipped to the customer.

*Parts 1, 2 and 3 were published in our issues for January, February and March, 1923.

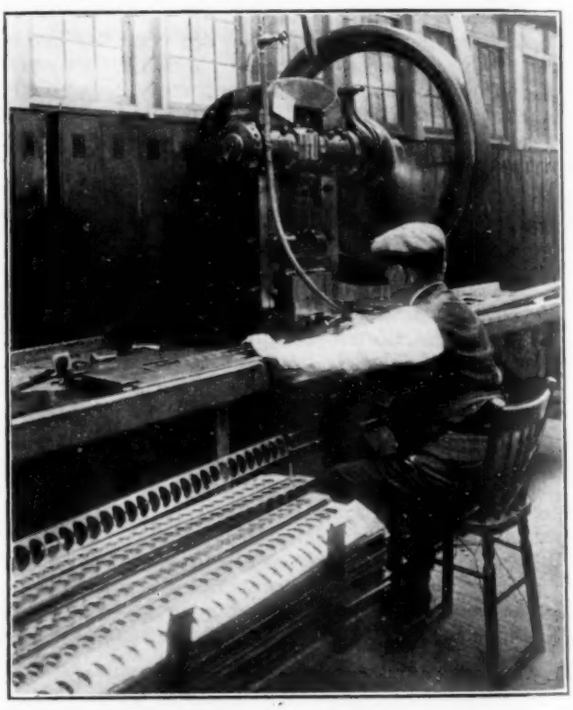


FIGURE 17.—BLANKING DIALS

FIGURE 16.—FINISHING ROLLS

British Institute of Metals

A Report of the Fifth Annual General Meeting

The fifth Annual General Meeting of the Institute of Metals was held March 7th-8th, at the House of the Institution of Mechanical Engineers, Storey's Gate, Westminister, S. W. 1. It was reported that the membership had risen to 1458. Some changes were made in the Committees and W. M. Corse of the National Research Council, U. S. A., had been appointed Honorary Correspondent to the Council to replace Dr. S. L. Hoyt, resigned.

Leonard Sumner was re-appointed President for 1923.

Papers presented were as follows:

THE MECHANICAL PROPERTIES OF MAGNESIUM ALLOYS

BY LESLIE AITCHISON.

The main conclusion to be drawn from the various tests is the great superiority as regards mechanical properties possessed by the alloys that have been worked—whether hot-worked by forging or extruding, or also cold-worked by strip rolling.

The mechanical properties of the alloys have no definite theoretical interest. The test results do, however, indicate what can be expected from these alloys by anybody who wishes to incorporate them in any engineering structure. In general, it is the aircraft engineer who might be expected to be interested in such light materials. It is a little doubtful whether for his purpose the alloys really are effectively light, in view of their low elasticity and not conspicuously good mechanical properties. The slightly heavier alloys of aluminum are much better in both respects. Better properties in the magnesium alloys may follow from their further development.

FURTHER STUDIES IN SEASON-CRACKING AND ITS PREVENTION—THE REMOVAL OF INTERNAL STRESS IN 60:40 BRASS

BY S. BECKINSALE

The results indicate that low-temperature annealing is superior to other methods for the removal of internal stress in finished articles of 60:40 brass, but that reeling of rods or tubes has advantages when it is necessary to straighten these as well as to reduce the amount of stress in them while maintaining the maximum degree of hardness.

Internal stress in 60:40 brass is removed within a much lower temperature range than either the 70:30 or 70:29:1 (copper 70, zinc 29, tin 1) brasses, the amount of internal stress present being appreciably affected by treatment for one hour at 100° C. This agrees with the results obtained by Heyn, who found that three hours' treatment at 100° C. prevented an internally stressed α-β brass rod from cracking when submitted to a mercurous nitrate test.

The results indicate that a low-temperature heat-treatment at 175° to 200° C. for twenty to thirty minutes will reduce internal stress to a safe amount, while such a treatment will have only a very slight effect on the mechanical properties of anl but the most severely cold-worked specimen of 60:40 brass.

THE EXTRUSION DEFECT IN BRASS RODS EXTRUDED FROM A MULTIPLE DIE

BY R. GENDERS

The peculiar distribution of the defect lends confirmation to previously expressed conclusions as to the formation of the defect by the turning inwards of the billet skin to follow a funnel-shaped course to the die. Comparing the conditions present when extruding through a die having one central aperture, and through one having three small apertures near the centre, it would seem improbable that the frictional effect (and therefore the velocity gradient) or the temperature gradient, could be notably different in the two cases.

THE OXIDATION OF METALS AT HIGH TEMPERATURES

BY N. B. PILLING AND R. E. BEDWORTH

The metals may be separated into two grand divisions—the noble and the base. The characteristic property which separates them is the dissociation pressure of the oxide which tends to form; in the case of the noble metals this is so large that oxidation can only occur under very great oxygen pressures, and under ordinary conditions does not happen.

The oxidation of copper, has been studied in considerable detail, and the conclusions drawn indicate that the controlling factor in the mechanism of high-temperature oxidation is the solution and diffusion of oxygen in the oxide, and that the protective action of the latter is conditioned upon the necessity of oxygen penetrating the oxide layer by this means alone, before reaching the free metal surface.

THE STRUCTURE OF EUTECTICS

BY ALBERT M. PORTEVIN

The microscopical structure of a considerable number of binary eutectic alloys having been examined, an attempt has been made to give a methodical classification from the data thus obtained, due consideration being given to the work of previous authors. A brief summary of the terms in common use and the accepted views on the subject are given, in order that all chance of ambiguity may be avoided, due to the absence of precise definitions of the terms employed.

THE INNER STRUCTURE OF THE CRYSTAL GRAIN AS REVEALED BY METEORITES AND WIDMANSTATTEN FIGURES

BY COLONEL N. T. BELAIEW

Various octahedral sections are described, and their relation to the Widmanstätten figures emphasized. The suggestion is brought forward that the occurrence of Widmanstätten figures in metals crystallizing in the regular system is associated with the face-centered cubic lattice.

THE RECRYSTALLIZATION OF COLD-WORKED CADMIUM

BY MAURICE COOK

The work was primarily undertaken to ascertain the recrystallization properties of cadmium. Since it recrystallizes both speedily and at comparatively low temperatures, it is not very suitable for studying the actual mechanism of recrystallization, but rather the peculiarities.

THE CONSTITUTION AND AGE-HARDENING OF THE TERNARY ALLOYS OF ALUMINIUM WITH MAGNESIUM AND COPPER

BY MARIE L. V. GAYLER

At a temperature of 400° C. copper is practically insoluble in aluminium in the presence of magnesium.

Alloys of aluminium with low percentages of copper and magnesium do not possess the property of age-hardening after quenching from 400° C.

Some alloys, however, containing less than two per cent

magnesium, and more than one per cent copper, age-harden after quenching from 400° C.

With more than eight per cent magnesium, the ternary compound $\gamma(Al_6Mg_4Cu)$ appears.

Alloys containing over 10 per cent magnesium, with 1 or more per cent copper, show the compound $\beta(Al_3Mg_2)$ present as one of the constituents.

THE CONSTITUTION OF SOME ALLOYS OF ALUMINIUM WITH COPPER AND NICKEL

BY KATHLEEN E. BINGHAM AND J. L. HAUGHTON

The ternary system copper, nickel, aluminum has been investigated up to 12 per cent copper and 10 per cent nickel. The main direction has been established within certain limits of temperature.

THE TERNARY SYSTEM ALUMINIUM-COPPER-NICKEL

BY CHARLES R. AUSTIN AND A. J. MURPHY

Cooling curves have been taken on about 250 alloys covering the whole ternary diagram, the determinations being most numerous in the area 0 to 20 per cent aluminum and 0 to 20 per cent nickel. The alloys have also been examined microscopically.

From the data obtained the authors have been able to establish the liquidus surface for the complete system, and to deduce with a fair degree of certainty the solidus for alloys rich in copper and nickel, and with aluminum contents ranging from 0 to 20 per cent on the copper-aluminum side and 0 to 32 on the nickel-aluminum side.

VOLUME CHANGES ACCOMPANYING SOLUTION, CHEMICAL COMBINATION, AND CRYSTALLIZATION IN AMALGAMS

BY ARTHUR W. GRAY

The purpose of the paper was to elaborate a hypothesis outlined to the American Physical Society in December, 1921, to account for the peculiar alternation of contractions and expansions that a dental amalgam undergoes during and after the process of hardening and to illustrate its application by showing how dimensional changes observed under various alterations of influencing conditions can be accounted for. The hypothesis seems to be consistent with all facts at present known.

THE MODULUS OF DIRECT ELASTICITY OF COLD-DRAWN METALS AS A FUNCTION OF ANNEALING TEMPERATURE

BY PROFESSOR F. C. LEA, V. A. COLLINS AND E. A. F. REEVE

The experiments described in this paper are part of a number of investigations, which the authors have undertaken, to determine the effect of cold-work and subsequent heat-treatment on the properties of certain metals.

THE HEAT-TREATMENT AND MECHANICAL PROPERTIES OF ALLOYS OF ALUMINIUM WITH SMALL PERCENTAGES OF COPPER

BY D. HANSON AND MARIE L. V. GAYLER

1. Copper-aluminium alloys containing 0 to 2 per cent of copper are not appreciably affected by quenching from 500° C. and subsequent aging.

2. Alloys containing 2.5 to 5 per cent of copper are profoundly affected by this form of heat-treatment. The strength of a rolled and annealed 5 per cent alloy is increased from 12 tons per sq. in. to 23 tons per sq. in. as a result of quenching and aging: at the same time the elongation is high.

3. Further treatment of quenched and age-hardened material, at a temperature higher than the normal, does not improve the tensile strength, but in some cases the Brinell hardness is increased.

SOME PROPERTIES OF THE COPPER-RICH ALUMINIUM-COPPER ALLOYS

BY R. C. READER

The object of the research was to investigate certain properties in relation to which doubt existed or further information appeared desirable. The general outline of the experimental work undertaken is as follows: 1, Density. 2, Volume changes during and after solidification. 3. Self-annealing properties. 4. Effect of heat-treatment on the 10 per cent alloy.

THE HARDNESS OF CERTAIN COPPER α SOLID SOLUTIONS

BY A. L. NORBURY

The object of the present research was to measure the hardness of certain of these copper-rich α solid solutions in order to compare the relative effects of different elements in increasing the hardness of copper; the ultimate object being to see if an element's "hardening" capacity could be correlated with one of its other atomic properties, such, for instance, as its atomic volume. In the paper, therefore, the hardnesses of alloys of copper and various percentages of aluminium, silicon, manganese, nickel, zinc, silver and tin, solid solution were measured.

THE HARDNESS OF ANNEALED COPPER

BY A. L. NORBURY

The object of the research was to obtain a more definite expression for the Brinell hardness of copper.

The results obtained when plotted according to the above formula, permit the deduction of a hardness value which is constant for all specimens of worked and annealed cathode copper, if complete recrystallization has occurred.

THE DENSITY AND THE HARDNESS OF THE CAST ALLOYS OF COPPER WITH TIN

BY HAROLD HEAPE

The algebraic sum of the changes in volume, occurring on alloying and during subsequent solidification, is in every case negative; or, in other words, results in contraction.

Though the density and the hardness are related, it is not possible to determine the exact relationship by means of determinations made on cast alloys.

THE SCLEROSCOPE HARDNESS TEST—A NEW FORM OF MAGNIFIER HAMMER

BY R. GENDERS

It is shown that lack of agreement exists between the magnifier hammer readings in different scleroscopes, due to slight variation in the contour of the striking portion of the hammer nose. As a remedy for this difficulty, which restricts the usefulness of the scleroscope, a new form of magnifier hammer has been devised, in which constant contour of the nose is ensured by employing a hardened steel ball. The 3-mm. ball hammer is suggested as a suitable form to supersede the ordinary magnifier hammer as a standard.

TESTS ON WORK-HARDENED ALUMINIUM SHEET

BY PROFESSOR H. C. H. CARPENTER AND C. COLDEN SMITH

1. Long-period heating tests on the rate of softening of work-hardened aluminium sheet have been carried out in the temperature range 200° to 100° C. The total period of the test was 41,000 hours (4.68 years). Mechanical tests were carried out on the sheet from time to time. after 2.46 years the specimens were cooled to the ordinary temperature and maintained there for two months, and then reheated to the original temperatures. The heating was continued for a further period of 2.22 years.

Bright Annealing of Copper Wire

Some Interesting Experiments on Annealing Copper in an Atmosphere of Natural Gas*

By P. E. DEMMLER†

The apparatus in which the process of bright annealing of copper wire was carried out consisted of a section of iron pipe, 6 ft. long and 3 ft. in diameter. The pipe was provided with flanges to which were bolted the end plates for sealing, also with inlet and outlet tubes to allow for the displacement of the air in the pipe by natural gas. After charging with copper wire, sealing and displacing the air, the pipe was heated to 350° C. (662° F.). It was expected that the natural gas would furnish a neutral atmosphere which would prevent oxidation and give a satisfactory bright-annealed product. It was found, however, that the outer layers of wire were discolored and not suited for the use for which they were intended.

To obtain an idea of what was taking place in the annealing furnace, skeins of the hard-drawn wire were placed in a glass tube so that all changes in appearance could be observed as they were heated to different temperatures and under varying conditions. The temperature in each case was determined by means of a thermocouple placed in the tube close to the wire. Following is a summary of the results of these experiments:

1. When the wire was heated for 1 hr. in a current of natural gas at a temperature of 350°, 400°, or 500° C. (662°, 752°, or 932° F., respectively), there was a marked darkening of the wire throughout the skein.

2. When heated for 1 hr. in natural gas at a temperature of 600° C. (1112° F.), there was no coloration, the wire remaining clean and bright.

3. When heated in natural gas to 350° C. until darkened and the treatment continued with the temperature raised to 600° C., the coloration disappeared and the wire became clean and bright.

4. When heated to 350° C. in natural gas that had been passed over copper heated to 600° C. before entering the annealing chamber, no coloration was produced, the wire remaining clean and bright.

5. When heated in air to 350° C. for 15 min., a heavy scale of oxide was produced. On displacing the air by natural gas and then heating to 600° C., the dark color disappeared and the wire became clean and bright.

OXYGEN IN NATURAL GAS

The coloring of the copper wire during the bright annealing process was evidently the result of oxidation caused by a small amount of oxygen contained in the natural gas. The presence of oxygen in the gas was demonstrated by alkaline pyrogallate solution, which became dark in color after passing the gas through it for several hours.

The source of the oxygen in the gas was not determined. According to G. A. Burrell[1] the traces of oxygen shown on analysis are not necessarily present in the gas at the wells, but are probably introduced as the gas traverses the pipe lines. Burrell, Seibert and Oberfell[2] state that oxygen is not a constituent of natural gas as it occurs in the earth, while F. C. Phillips[3] states that traces of oxygen are indicated with great positiveness in gas as it flows directly from the wells and under high pressure. In some places, the amount of natural gas, as supplied to the consumer, is, at times, increased by the addition of manufactured gases, as shown by the presence of considerable amounts of carbon monoxide, carbon dioxide, hydrogen, oxygen, and nitrogen. The presence of oxygen at any time presents a factor that must be considered and dealt with in the process under consideration. While the facts here presented refer to the use of natural gas for producing a neutral atmosphere, similar points would require attention in the case of coal gas and other manufactured gases.

TREATMENT OF NATURAL GAS

The experiments outlined above demonstrate that the bright annealing of copper wire in natural gas containing small amounts of oxygen is possible by either of two procedures: (1) Heat the wire to 600° C.; or (2) pass the natural gas over copper heated to 600° C. before passing it into the annealing chamber, containing the wire to be annealed, heated to 350° C.

Practical considerations indicate that the second method is the more desirable. There is a considerable saving in heating the large annealing chamber to 350° C., rather than to 600° C. Furthermore, it is not practical to anneal wire on spools at 600° C., as at this temperature the expansion causes the wire to weld so that it may become impossible to unwind it from the spools. The small amount of copper wire necessary for treating the gas in the preheating furnace lasts indefinitely, as the action is catalytic and there is no noticeable change in the copper after use.

The explanation of the action is, briefly: Natural gas is composed largely of hydrocarbons of the methane series; it may contain small amounts of other hydrocarbons, also hydrogen, nitrogen, and other gases. The amounts of oxygen may vary from none to several per cent. of the gas. When gas containing small amounts of oxygen is passed over copper heated to 350° C., as in the bright annealing process, the oxygen will combine with the copper and form a dark skin of copper oxide; the hydrocarbons will not combine with the oxygen in the gas nor will they reduce the copper oxide. At 600° C., the hydrocarbons will reduce the copper oxide to copper, an equivalent amount of hydrocarbon being oxidized to carbon dioxide and water. We may thus consider that, at 600° C., the copper is oxidized to copper oxide, which, however, is immediately reduced by the hydrocarbons present, the copper acting as a catalytic agent, causing the reaction between oxygen and hydrocarbon at a temperature lower than that at which they would react in the absence of copper. The ignition temperature[4] of an explosive mixture of methane and oxygen is given as 650—750° C. The final reaction may be represented by the equation

$$CH_4 + 2O_2 = CO_2 + 2H_2O$$

but there is the intermediate reaction between copper and oxygen, so that the complete reaction may be represented by the equations

$$4\,Cu + 2O_2 = 4\,CuO$$

*A paper read at the New York Meeting of the Institute of Metal Division February 19-21, 1923. This paper appeared in abstract with the discussion, which followed in our issue for March, 1923.

†Chemical Engineer, Research Laboratory, Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.

[1]Characteristics of the Natural Gas used at Pittsburgh: U. S. Bureau of Mines, Bull. 15, 64.

[2]The Condensation of the Gasoline from Natural Gas: U. S. Bureau of Mines, Bull. 88, 68.

[3]The Chemical Composition of Natural Gas: Second Geol. Surv. of Pennsylvania, Part 1, Oil and Gas, (1886); reprinted in W. Va. Geol. Surv. (1904), Ia. 507.

[4]G. A. Burrell: U. S. Bureau of Mines. Bull. 15.

$$4\ CuO + CH_4 = CO_2 + 2H_2O + 4\ Cu$$

In this case, the steps of the reaction can be demonstrated and it may be classed as one of those certain cases of contact catalysis where it is known that certain definite intermediate compounds are formed.[5]

C. Sandonnini[6] found that in using copper as a catalyst in a mixture of ethylene, hydrogen and oxygen, the oxidation of the ethylene is not much increased, although the copper is oxidized, an action analogous to the oxidation of copper in natural gas as noted above.

Pretreatment of natural gas by passing it over copper heated to 600° C. thus furnishes a simple means of getting a satisfactory bright annealed copper wire, where annealing at 350° C. in natural gas produces a dark color. No change in either the annealing oven or the process is necessary; the apparatus for heating the gas can readily be connected outside the oven and the treated gas may be used in the regular process.

[5]First report of Committee on Contact Catalysis, W. D. Bancroft, Chairman: Jnl. Ind. & Eng. Chem. (1922) 16, 326.
[6]Gazz. Chem. Ital. (1922) 52, 1, 394-408. Chem. Abst. (1922) 16, 3571.

Plating Nickel Upon a Zinc Deposit

By J. ANDREW WARNER*

This article deals with the results obtained after a year of experience on the part of the writer in plating automobile bumpers. We will not attempt to describe methods that have been discarded in the course of this time, but will try to deal only with methods that have proven satisfactory.

The bumpers which are made of carbon spring steel are heated and bent to the proper form, then tempered, leaving a heavy scale which is removed by placing them in a warm sulphuric pickle. This pickling solution removes the scale in from an hour to an hour and a quarter. The bumpers are then rinsed in cold water and placed in hot water, into which has been dissolved three ounces of tri-sodium phosphate to the gallon; this is for the purpose of neutralizing any acid that might cling to the work from the pickling vat. Here it is left for five or ten minutes; then it is ready for the polishing room.

The bumpers are roughened out on sixty emery and after fining on various finer emerys, are finished on 220-bull neck oil wheels, and colored on felt wheels with 6-A emery.

The bumpers are then placed on racks holding two bumpers each, which compose nine square feet of plating surface and cleaned in an electric cleaner composed of four ounces of soda ash, two ounces of tri-sodium phosphate and one-half ounce of caustic soda per gallon, connected with a double throw switch; from here they are rinsed and transferred to the zinc.

We are using a cyanide zinc solution, at a temperature of 120 degrees F. and give a hydrometer test of 30; the tank is wired direct; no rheostat is used. At 50 amperes per square foot a fairly heavy deposit is obtained in two or three minutes. In regard to the upkeep of this solution the problem of keeping the anodes clear when the solution is in constant operation is difficult. In order to keep the anodes as clean as possible, plenty of caustic soda is used. In a solution kept at this temperature, this caused anode corrosion to an alarming degree, but we found this would be overcome by replacing some of the zinc anodes with steel anodes. By this method the metallic contents can be regulated by the amount of steel anode surface used. Should the zinc deposit become rough, ammonium chloride is added; gum arabic improves the color and also aids in obtaining a smooth deposit.

The bumpers are taken from the zinc tank, rinsed in cold water and placed directly in the nickel tank. What this solution was originally composed of, the writer is unable to state; it appeared, however, to be an ordinary nickel solution, consequently unfit to plate over zinc.

Nickel carbonate was added until the solution stood neutral or nearly so. Three ounces each of sodium chloride, magnesium sulphate and ammonium chloride to the gallon was added. Two parts nickel chloride to one part sodium citrate was added until the solution which originally stood 6 Beaume, now stood 14. From this point on nickel chloride is used monthly. Sodium citrate should be added occasionally; double nickel salts can be added now and then. Nickel carbonate should be added from time to time to take up the acid in the solution.

The anode rods were moved close enough to the cathode so that work suspended in the solution was approximately five inches from the anodes. Intense agitation by means of an arm, one end of which was connected with an eccentric above, the other end attached to one of the cathodes (this tank is a double tank), the cathode rods are connected at each of their ends by cross-pieces, the center of each works on a bearing. When in operation the arm has a stroke of six inches at a speed of 30 revolution per minute; this not only gives the work a vertical motion but a rolling one as well.

This tank is lead lined and kept at a temperature of 90 to 95 degrees F. by means of a lead coil. Work should not be plated in this solution under these conditions in cold weather without first warming the solution, as the plate will peel. Care also must be exercised so as not to allow the solution to become too warm, as the acid in the solution becomes more apparent as the solution is heated.

This tank is also wired direct and is run at 30 amperes per square foot and plates so rapidly that a five-minute plate will stand a heavy buffing on an eighteen-inch buffing wheel.

*From the Monthly Review, November, 1922.

Treating Sweeps

It has been my experience in order best to treat dust and sweepings, to proceed as follows:

Mix intimately with the dust, etc., about 1/3 of its bulk of nitre. Spread the mixture out on an iron pan to a depth of 2 to 3 inches, and ignite from time to time with a red hot poker in a number of places, until all organic and combustible matter has been consumed. When action is finished and material is cool, mix with it ½ of its volume of borax and nitre in the proportion of 5 of borax to one of nitre. Put a little of this mixed flux alone in the bottom of a crucible, and then add the prepared dust a little at a time, until the pot is about half filled. It is liable to overflow under the heat and, therefore, crucible should not be filled. Keep blast on until mass is quite fluid. To assist fluidity gentle stirring when high heat is being felt is advantageous. After perfect fluidity is reached, cut off fuel and let pot cool without disturbing. Next day or when perfectly cool remove pot, break same, and separate from flux the button which will be found at the base of the pot or bottom of congealed mass.

Soda ash is used when chlorides are to be reduced to metallic state. If chlorides are present in these sweeps, it would be well to use this flux noted above.—H. D. COLEMAN.

Plating Research Committee's Report*

A Letter from the Research Committee of the American Electro-Platers' Society to the Director of the Bureau of Standards.

WATERBURY, Conn., January 25, 1923.

The Directors of Bureau of Standards, Department of Commerce, Washington, D. C.

Dear Sir:

We, the members of the Research Committee, wish to submit the following report of our visit to the Bureau of Standards on January 19 and 20, 1923:

1st. This is the first time that any definite technical study has been made of any of the processes of electro-deposition.

2nd. In the past and at present, about the only new things offered in the electro-plating field are new formulas for solutions. The formulas are most generally empirical and merely a modification of the existing ones. In the Electro-Chemical Division the study of the principles underlying the function of the chemicals entering into a plating solution has been studied so that, in the case of nickel and acid copper solutions, it is possible to state just why a certain chemical should be added. This is clearly shown in Haring's paper on "Throwing Power." The great majority of platers have associated throwing power with conductivity. Haring has shown that there is a distinct difference between those two properties of a solution. His paper deals with fundamentals and is the first of its kind to be presented to the electro-chemist and plater. His work will mark a turning point in the study of electro-deposition and the results will be far reaching.

3rd. Hammond's work on the effect of different chemicals on the resistivity of nickel plating solution is to be commended. Several of the contemporary writers on electro-plating will be compelled to change their views, e. g., many advise the addition of magnesium sulphate to a nickel solution as a "conducting" salt. Hammond's experiments clearly prove that it materially adds to the resistivity of the solution and, in fact, has less "conductivity" than any of the chemical salts generally recommended. Thompson's study of the control of the acidity of plating solutions has developed a method by which consistent calculation can be had. Many of the results of experimenters with nickel plating have been proven to be of negligible value, due to not considering the alkalivity or the acidity of the solution used. His paper on the impurities found in commercial nickel salts has had a very marked effect upon the quality of nickel salts now offered. The publication of his paper was timely and the contents a revelation to platers and manufacturers in general.

Blum and Rawdon in their paper have shown that there is a distinct relation between the crystalline structure of the base metal and that of the deposited metal. During the last year two noted English authorities on electro-deposition have stated in their writings that there was nothing to prove such a relation and that in their work that there was no evidence of any difference in the structure of a deposited metal if it was deposited on a base with small or large crystals. Blum & Rawdon's preliminary experiments warrant further investigation. If what they have found is true of all electro-deposited metals then the work done on the use of "additional agents" will have to be entirely revised as, in no case, has any of the investigators taken the structure of the base metal into consideration.

Scott and Thomas are working on a very important phase of electro-plating, i. e., Nickel Anodes, it is well known that the structure and composition of nickel anodes materially affects the way they dissolve in solutions. Such work as is being done by the electro-chemical division is to be highly commended. The technical value of this work is considerable, and the commercial application of the principles developed will be far reaching. It is the first time in the history of electro-plating in this country that work of a real scientific nature has been done in a systematic way. The investigators have been guided in their work by persons who have made a real study of the needs of the electro-plating industry.

We realize that this work at the Bureau has just started and that there is much more to do. As members of the Research Committee of the American Electro-Platers' Society, we wish to thank the Director of the Bureau, the Chief Chemist, and the chief of the Electro-Chemical Division, for the opportunity of reviewing their work and offering suggestions for future development. We earnestly desire that this work be carried on and know that what will be done will be of much importance to the manufacturing industries of this country. The taking up of this work is timely. Heretofore the work of men in foreign countries has been held to be of more value than that done in the United States. This condition is changing and with the assistance given by the Bureau of Standards the American plating industry is forging ahead of all others.

The American Electro-Platers' Society heartily commends the work of the Bureau of Standards and offers all the assistance at its command to further the good work started.

Yours truly,

WILLIAM DELAGE,
Chairman Research Committee.

Research Committee: O. J. Sizelove, Phillip Uhl, William Delage.

Electro-Plating Advisor to the Bureau: George B. Hogaboom.

*From The Monthly Review, February, 1923.

Metal Finishers' Exposition

As we go to press the Metal Finishers' Exposition is being held in the Memorial Building, Dayton, O. It is run by the Dayton Branch, American Electroplaters' Society, and managed by a committee of which M. G. Kopf is chairman. A preliminary statement about this exposition was published in our March issue. A report will be published in May.

MEMORIAL BUILDING, DAYTON, OHIO

Black Silver Anodes

Trouble Caused by Impure Silver

Written for The Metal Industry by R. J. MARSH

It used to be, and perhaps still is, a common experience for silver platers to receive some silver anodes which, after they were used a few days would turn black, and a scum formed on the surface. This could be readily washed off, but would soon reappear and was objectionable because it sometimes floated off into the solution, making it dirty, lodged on the work being plated, causing roughness, and also because it prevented proper dissolving of the anodes, thus running down silver content of the solutions and making it necessary to add silver chloride or cyanide to keep the solutions in proper condition.

As the trouble did not usually show itself on all the anodes in a tub it was evident that the trouble was not in the solution, but rather that there was some impurity in the anode which did not dissolve in the plating solution. To solve this problem a fifty gram sample of a black anode and the same sized sample of a good one were dissolved separately in dilute nitric acid to start an analysis for small traces of impurities. It was at once noted that the black anode gave a slightly cloudy solution with a yellowish tinge while the solution of the good anode was clear.

Both solutions were placed on a steam table and left for a considerable period of time. The cloudy solution finally cleared up, a very small precipitate of a light yellow color settling to the bottom, while no sign of a precipitate showed in the other solution. This precipitate was filtered off, but upon washing with distilled water it turned nearly black in color and shrank considerably in volume.

A larger sample of the black silver was then treated similarly and a sufficiently large precipitate was obtained to permit some qualitative tests to be made. These showed unmistakably the presence of silver and sulphur, either in the form of sulphates or sulphides. No attempt was made to complete a quantitative analysis of the precipitate, or to determine the amount present in the black silver.

A quantity of the black anodes were remelted and a blast of compressed air blown through the molten silver for a few minutes with the idea of oxidizing any sulphur present. This was entirely successful as the silver so treated made satisfactory white anodes.

The fact that silver sulphide is with difficulty soluble in cyanide especially in weak solutions and also the observation that some solutions with a higher content of free cyanide gave much less trouble with black anodes further confirmed the conclusion that sulphur was the cause.

No further work was done at this time as the simple method above described was found to prevent further trouble from this cause. Some time afterwards the writer found the statement in a very old chemistry book that when silver containing sulphur was dissolved in nitric acid a yellowish precipitate remained insoluble, this consisting of a double compound of silver sulphate and sulphide which was decomposed by water, the sulphate going into solution and the black sulphide remaining insoluble. As this was exactly the result found in the above analysis it afforded the final proof that sulphur caused the trouble.

The writer does not claim that sulphur is the only cause of black silver anodes as there are probably several other impurities that could be present which would give the same trouble. As an example might be mentioned the similar trouble that developed some time later and which a few experiments showed could not be explained as due to sulphur.

An analysis was started as above described but was carried further, the silver being precipitated as chloride and removed. The small amount of copper was removed from the solution of both the black anode and the good one by means of hydrogen sulphide. After the copper precipitates had been filtered off and the excess hydrogen sulphide removed, the addition of ammonium hydroxide brought down a considerable white precipitate which proved to be aluminum hydroxide. To confirm this some of the black scum was rubbed off from the anodes and analyzed and proved to be mainly aluminum, although no quantitative analysis was made. The concern from which the silver was bought immediately stopped the trouble as soon as the presence of the aluminum in their silver was called to their attention.

An interesting feature in this case was the fact that it would be expected that aluminum would readily go into solution in a silver solution. No time was available for investigating the reason why it did not and the writer could only form a theory that it must have been present in the anode either in some chemical combination or more likely as an alloy which would not allow it to act as would be expected from the element alone.

Brazing Copper Tubing to Brass Fittings

An oxy-acetylene engineer, calling on a manufacturer, observed the experiments that were being made to find an economical method of making tight joints between the copper tubing and brass fittings. He demonstrated that brazing with the oxy-acetylene blowpipe would serve that purpose.

COPPER COILS BRAZED TO BRASS

The manufacturer adopted brazing for this work, and began to produce heaters containing copper coils. In a short time he was selling more of these than of the heaters containing cast-iron coils.

Without the suggestion of the visiting engineer, this manufacturer undoubtedly would have employed swaged joints or spelter, either of which would have cost more than brazing, and produced an inferior connection.

One operator brazes an average of 100 coils in seven hours. This amounts to 400 brazes, since each heater contains two coils, both ends of which are joined to two brass fittings having double outlets.

The coils are tested under 250-lb. hydrostatic pressure. Records kept on a production lot of 400 coils showed only one small leak.—Oxy-Acetylene Tips.

Secondary Non-Ferrous Metals

The Importance of Remelted Material to Metal Users and Producers*

By W. M. CORSE, National Research Council

The United States Geological Survey tells us that the value of secondary metals in 1921 was $89,140,500.00. Its weight was 436,768 tons. The economic importance of the subject immediately becomes apparent. The term "secondary metal" means "reworked" or "reconditioned" material. This product is offered in the form of scrap. turnings or borings, and ingot. While some secondary metal from wrought stock can be secured in the market much of this class of material goes back directly to the rolling mill from which it came. Naturally, the turnings or borings find their way to the smelter because of the uncertainty of the composition in most instances.

Many of our brass foundries today can afford to install a simple outfit for the recovery of metallic waste. The last installation that was made under my direction was in 1921 and cost approximately three thousand dollars. The metal recovered paid for the entire equipment during the first year. It consisted of a special form of ball mill crusher with automatic discharge connected with a concentrating table. The product consisted of three grades of material: First, large pieces of metal that would not pass a ¼" sieve; second, a concentrate carrying about 65 to 75 per cent metal; and, third, a tailing running under 1 per cent of metal. The first could be melted in any quantity in the foundry; the second was added in small quantities to the charge; the third was sent to the dump.

Some concerns prefer to insert a jig for some of the intermediate operations after the crushing operation. By this method a product is produced which can be used directly in certain proportions, thereby reducing the amount of fine material to be handled by the concentrating table. Automatic handling equipment may be installed with profit in some cases, but the average foundry needs nothing more than the crusher, jig, and table combination. There are a few concerns who specialize in this equipment and can furnish advice as to the best type for any particular plant. Special conditions may make it seem advisable to sell metal-bearing refuse direct to the smelter, but as a general thing I believe it will pay to have a recovery plant, even though the concentrates are later sold.

It does not usually pay to attempt to concentrate to too great an extent, because the loss in the tailings more than offsets the difference in values. Some smelters estimate that a concentrate of between 20 and 30 per cent metal is the most economical for the small recovery plant.

Foreign or purchased scrap, the first of the three kinds of secondary metals mentioned above, consists of pieces of metal of crucible size or above. It is usually offered for sale in sorted lots, depending on the kind of casting the foundry is producing. So many variations in grading are possible that only experience can determine the advisability of using this variety. Like all of the three kinds its principle advantage is saving in cost.

Turnings or borings, because of their nature, offer some advantages and some disadvantages over foreign scrap. Non-metallic contents are not so easily detected, but the possibility of constant composition through careful mixing is an advantage. High melting loss when used directly combined with the possibility of excess oxide inclusions make two meltings desirable. The first of these is best done by the smelter. In large plants, the smelter may be a department of the foundry, but it is usually a separate concern.

The addition of clean, mixed borings of known composition may be made to the melt direct, but as many plants have sufficient of this class of material from their own machine shops it is not usually practiced. The slowing down of the melting time by adding borings is sometimes a disadvantage. In some cases turnings are cabbaged and borings are briquetted. This may result in a slight reduction in melting loss, but the principal advantage is in the time saved in handling.

The third form of secondary metal is ingot brass. Twenty years ago this product was in disrepute, but gradually better production methods have improved the quality of the product so that now the use of a high-grade brass ingot is considered good practice by many of our most exacting foundries. Raw material which can not be used directly can be smelted in a reverberatory furnace, brought to formula and cast into ingot. This method does not usually produce as good quality as when clean turnings are melted with the addition of scrap copper or tin to bring it to formula. Sometimes a combination of reverberatory furnace ingot can be made with turnings and scrap copper to produce good quality metal. The quality of product depends largely on the knowledge and skill possessed by the smelter. Careful, intelligent, and honest methods can bring good results. The advantages of a good brass ingot over other kinds of secondary metal are:- 1. Saving in time in handling. 2. Saving in time of melting and consequently of fuel. 3. Uniformity of composition. 4. Lower costs.

The increased use of brass ingot demonstrates that the above advantages are being realized by progressive manufacturers.

One advantage of the expert use of secondary metal is that such metals normally carrying elements classed as impurities may be mixed so as to take advantage of these impurities in another composition in which they are normal or necessary constituents. For example, cupro-nickel scrap may be added to mixtures for nickel-bronze, and iron-bearing yellow brass may be transformed into manganese bronze. The latter is described in a paper by P. E. McKinney, entitled "Manganese Bronze," presented before the American Institute of Mining and Metallurgical Engineers in February, 1919. I wish to emphasize one important point. In order to get the best results, it is necessary to employ the untmost laboratory control of raw materials, primary and secondary, particularly the latter.

It seems to be the case with some foundries that secondary metal produces hard spots in the castings. Careful inquiry at the U. S. Naval Gun Factory revealed the fact that they have less trouble with machining when using secondary metal. This confirms the statement that careful laboratory control pays good dividends.

The American Society for Testing Materials, the leading society in the preparation of specifications for engineering materials, has issued specifications on the following non-ferrous compositions in ingot form: Manganese Bronze, Composition "G" U. S. N., Bronze Bear-

*An address delivered before the brass section of the Employers' Association of Detroit at their March meeting.

ing Metal (6 formulae), Brass Ingot Metal (7 formulae). These have been carefully prepared by committees of experts, and represent the leading thought on the subject today.

Besides the alloy compositions in secondary form, we also have scrap copper, tin, lead, zinc, aluminum and nickel alloys. Some forms can be used directly and other go to the smelter. Casting copper is the product of the reverberatory furnace, using secondary metal as a raw material. It usually runs over 99 per cent copper contents. Re-run aluminum ingot made from secondary metals is a regular product today, and with better knowledge of this metal its quality is improving. Probably the largest amount of secondary aluminum finds its way back to the smelter of the virgin metal because the melting losses due to oxides make it difficult material to handle by such methods as are employed with brass.

Because of the special nature of monel metal and pure nickel, the market for these in secondary form is somewhat limited. A certain percentage finds its way to the foundries, but monel metal may get mixed with nickel silver, thus introducing zinc when possibly not wanted. It is probably better to communicate with the producers than to handle through scrap dealers. The Development and Research Department of the International Nickel Company, New York City, can advise regarding the best methods of disposal or purchase of this class of material.

Many people have the idea that no casting made from a melt containing secondary metal can possibly be as good as when all primary metal is used. If such people could have the privilege of visiting the brass foundry of the U. S. Naval Gun Factory at the Navy Yard in Washington and see what is being done there, think they would be surprised. Stimulated somewhat by the policy of the Navy to rework its own scrap, the metallurgists there have produced regularly castings that have passed all Navy specifications from melts consisting principally of secondary metals. Inspection of every heat precludes any doubt about this result. It shows what can be done when intelligent, careful control is practiced by the metallurgist, coupled with an excellent working knowledge of foundry conditions.

If more of our people realized how much scientific research in many branches owes to the painstaking and careful work done by the men in the various Naval departments, they would see that the industrial value of the Navy Department goes a long way towards paying its cost to the country.

Silver Plating Cutters

An Answer to the Editorial "Do We Need Greater Accuracy?"*

Written for The Metal Industry by CHARLES H. PROCTOR, Plating-Chemical Editor

In responding to F. C. Mesle's editorial in the February 1923 Monthly Review A. E. S. "Do we need greater accuracy in handing out plating information" I would respectfully refer Mr. Mesle to his own paper read at the St. Louis Convention of the American Electro Platers' Society June 29-30 July 1-2, 1917, entitled "Factors of Importance in Silver Plating" printed in full in the September 1917 issue of the Bulletin, pages 10 to 16. It will be remembered in Mr. Mesle's previous editorial upon the subject in question that the main point of attack was based upon the inference made that if 2 amperes could be carried safely upon a tin coated steel knife plated in a silver solution, then 24 amperes could be readily carried on a dozen such knives, it was the writer's opinion that 24 amperes would be near the correct amperage.

If Mr. Mesle is accurate in his statements made in the paper mentioned above, then surely some plating departments are being run on a very low efficient basis. He refers to amperages from 45 to 100 per square foot of surface area about equal to the surface of a dozen steel knives. It will be desirable to have a response from Mr. Mesle, otherwise I shall request that abstracts be made from his article and published in THE METAL INDUSTRY that will prove the fallacy of his statements made in his 1917 paper as compared with his attack made upon the accuracy of the writer's information, which he evidently still questions in his second editorial, published in the Bulletin, February 1923 issue.

Some extracts taken from Mr. Mesle's 1917 article covering amperages upon a square foot of surface area plated in efficient silver solutions.

In the **Introduction** no attempt is made in this paper to say what the precise strength of silver or cyanide should be in an efficient solution as this will vary with the work to be plated and the nature of the finish desired.

Under cyanides in the silver solution, presumably free cyanide, that was used in three solutions, 4½, 6½ and 8½ ozs. respectively, he mentions current densities of 45 amperes to 60 amperes per square foot of surface. Samples were evidently shown from the solutions because he states that the 4½ ozs. solution gave the best results at 45 amperes C. D.

Under **Silver** he mentions a C. D. of 10 amperes for a silver solution containing 2 ozs. silver per gallon of solution, and further on mentions a 100% increase in C. D. when the silver content of the solution is doubled.

Under **Temperatures** he mentions current densities from 60 to 100 amperes in solution ranging from 72 to 112 F. Further on he states that a temperature of 50% increase above normal will allow a 60% increase in C. D. or speed of deposit and still do good work. These same solutions when used at a C. D. of 10-20 amperes produced a white, hard deposit, difficult to finish upon the regular way.

Under the **Addition of Disulphite of Carbon,** in the concluding paragraph, he states:

"In our opinion every one of these factors needs to be taken into careful consideration in the making and regulating of a silver solution and in so doing it is possible to lay down a good deposit of silver at a current density of 40 to 60 amperes or 100 times faster than is done by a C. D. of 3 to 6 amperes as is done in ordinary practice and recommended in many books on electro-plating."

The paltry 24 amperes C. D. per square foot of surface mentioned by the writer which was the basis of Mr. Mesle's attack, appears insignificant as compared with current densities of 60 to 100 amperes per square foot of surface, he mentions as the basis of efficiency in successful silver plating solutions.

*Previous statements in this discussion were published in THE METAL INDUSTRY for January, 1923, and the Monthly Review for November, 1922, and February, 1923.

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EDITORIAL

SAFETY, SANITATION AND WELFARE

A bulletin issued by the U. S. Steel Corporation recounts the work of the Safety, Sanitation and Welfare Department. Although somewhat complex because of the enormous size of the organization which it serves, this department can well be held up as a model for those of other industrial organizations. The work is carried on through various committees, such as Safety, Housing, Sanitation and Education. In addition there are the Central Safety Committees, made up of important officials from various divisions, the Plant Safety Committees, which are made up of important officials from the various plants and the Plant Workmen's Safety Committees which are made up of the rank and file. Also there are the Plant Departmental and Special Committees made up of foremen, master mechanics and skilled men.

Statistics show that since 1906, the decrease in accident rates per thousand employees starting from 1906 as a basis, has reached 56 per cent. According to these same figures, a total of 35,313 employees have been saved from serious injury in these sixteen years. The figures are necessarily incomplete since they do not show the annual number of injuries over that period but they are nevertheless indicative.

An interesting analysis of the causes of accidents shows that 44 per cent of all accidents occur in hand labor; 15 per cent occur in the mines; 8 per cent caused by falls; 7 per cent by burns; almost 5 per cent of machinery; 4 per cent on the railroads, and miscellaneous, about 11 per cent. It is noteworthy that the most important detailed items under these accident causes are such things as (1) being struck by falling material; (2) haulage or skip-track accidents in the mines; (3) slipping or tripping on the ground level; (4) burns caused by hot metal, flue dust and flames; (5) falling from railroad engines; (6) accidents on cranes.

The bulletin shows the extraordinary amount of money expended by the Steel Corporation for its employees. The total of welfare expenditure from January 1, 1912, to September 30, 1922 is stated to be $108,509,723 This includes the numerous educational and recreational activities both for men and women.

The main impression gained from this bulletin is that of a change of spirit from the days when the factory was a place to turn out materials and nothing else. The attitude now is that the workers are a part of the organization and not merely so much to be added to the cost sheet.

THE USES OF PUBLICITY

In this age of sensations, fads and discoveries Tut-ankh-Amen, the Egyptian, has finally come into his own. After fashion claimed him for women's clothes, advertising, for whatever purposes it needed him, Egyptology for a tremendous impetus to that science (which incidentally was perfectly legitimate), finally copper has come forward and claimed him for its brother.

In a recent issue of a bulletin of the Copper and Brass Research Association, we read the following:

"The 'ankh' was the symbol of enduring life that visualized to the Pharaoh his hope of a second existence, the extent of this faith in which is now so fully revealed by the ample provision he made for it. . . .

"Three thousand years is a long time, and so, while Tut-ankh-Amen laid up great stores of many wondrous things, among which copper and bronze are frequently seen (and it should be noted are among the few materials at Luxor which are freely handled because of their splendid state of preservation) when everything else was completed, when the last wonder was in place, the whole was secured by a bronze lock on a door secured with hinges also of the Everlasting Metal. . . .

"Much of the copper used in Egypt came from the Island of Cyprus, and it is significant that we later find the same symbol, the 'ankh,' still denoting enduring life in the person of the goddess Venus (Aphrodite) who, according to mythology sprang from the foam of the sea and was wafted over the crest of the waves to Cyprus, the island from which copper derived its name."

This continues until finally the writer finds a "direct" connection between the word "ankh" and the word "copper." Hence copper stands for enduring life. Hence copper is the brother of all that lasts "forever."

We note with interest the haste of the publicity department of the Research Association in applying a current event to "immortalize" copper, even if it did take a rather long stretch of the imagination to connect Tut and cuprum. For there has been little metal found in the tomb of Tut-ankh-Amen. THE METAL INDUSTRY recorded in the March issue the discovery of a small bronze ornamental headpiece, but most of the specimens unearthed so far have been fabrics and wood, the latter richly ornamented with gold, according to the daily press reports.

However, the Research Association is keeping more than abreast of the times and the findings of the newspapers. We can still believe that copper and bronze are practically everlasting.

FOUNDRYMEN'S CONVENTION

The Annual Convention of the American Foundrymen's Association will be held this year in Cleveland, April 28 to May 3. Advance information states that the space has been oversold and that the prospects for a big and active convention were never better.

Last year, the convention was held after a gap of almost two years. The gathering was a brave effort in the face of adversity. It was not only a brave effort however, but a successful one. This year, with everything on the rise and the foundry industry ready for one of its best years, the convention should rank with the best.

The technical program is excellent; the entertainment features are plentiful; visitors are certain to have a good time in seeing friends exchanging reminiscences. They will advance not only their own interests by attending, but also those of the foundry industry in general.

BRASS BURNISHERS

In a very interesting article in a recent issue of the Waterbury "Republican" is given at considerable length, a historical sketch of brass manufacturing, and particularly the importance of the old "burnishers." It seems that only through the importation of skilled workmen from England could early manufactures, such as buttons, hold their own in competition with other sources. These newcomers were skilled men of the highest type, artisans in fact, and owned their own tools, which they brought along with them. It is stated that the Scovill Company today retains the kit of John Sandland and George Tompkins, which was brought over between 1820 and 1830.

The Sandland family were among the earliest to come to Waterbury, Edward Sandland being one of the first skilled burnishers in that city. His grandson, William H. Sandland became mayor of Waterbury.

It seems that a James Croft came to Waterbury about 1820 and was hired by the Scovill Manufacturing Company to show them how to make buttons out of brass. He showed that he really understood this business and by means of his constructive suggestions gave a great impetus to the button industry. Other men followed him and the industry grew steadily.

An important point in the ability to burnish properly was the possession of good polishing stones which were polished bloodstones. These stones were so highly prized that they were even given a considerable market value, and traded in, being swapped back and forth like any other commodity of intrinsic value.

The Sandland family seems to have been prominent even up to the present day in Waterbury industries. Although it is perhaps too broad to credit them with the growth of the brass industry, it is not too much to say that without their help, the industry could never have built itself the foundation upon which to base its present size.

WASTEFUL VARIETY

The Chamber of Commerce of the United States is waging a campaign against wasteful variety in manufactured articles. A communication from them states that this campaign is now actively afoot in nearly 40 industries which turn out everything from coffins to carpet tacks. The Department of Commerce is co-operating in this work of minimizing industrial waste, and it is stated that very real progress has been made in recent conventions in Washington.

Some of the objects standardized and working to have their excessive variety, styles and sizes, etc., eliminated, are as follows: woolen and worsted cloth; metal laths; wood, tin or glass containers; blankets; steel lockers; sash and door millwork and range boilers.

The bulletin notes that the initiation in any standardization determined upon rests with the industry itself. This, of course, is as it should be, since radical changes of this kind cannot be driven into an industry from the outside, but must spring from the desire of the members themselves to improve their situation.

There is also a strong feeling that this should be attempted in the metal industries, which are, as everyone knows, suffering acutely from the disease of too many products. Certain quarters have taken up the idea and are working on it at the present time, but it has not yet become general.

RESEARCH IN ELECTROCHEMISTRY

The American Electrochemical Society has issued a booklet of suggestions for research problems among which are a number which might be of considerable interest to workers with non-ferrous metals. They are:

Electrolytic Deposition of Brasses and Bronzes.
Electrical Conductivity of Metals and Alloys Above Melting Point.
Stability of the Metal Carbides at Elevated Temperatures.
Stability of the Metal Silicides at Elevated Temperatures.
Gaseous Reduction of Metal Compounds.
The Electrolytic Corrosion of Alloys.
Catalytic Phenomena in Electrolytic Reactions.
The Occlusion of Gases by Metals at Electric Furnace Temperatures.

TECHNICAL PUBLICATIONS

The Services of Henry Clifton Sorby to Metallurgy. The second Sorby Lecture, delivered by Cecil H. Desch, Professor and Dean of the Faculty of Metallurgy in the University of Sheffield, England, October 31, 1921. A short history of Sorby's contributions and his pioneer work in establishing metallurgy as a science.

Corrosion Tests.—According to Bulletin 4 issued by the Carnegie Institute of Technology, Pittsburgh, Pa., on metals for coal mine equipment, brasses, which contain considerable zinc were corroded rapidly; bronzes containing considerable tin were also corroded, but to a less extent than the brasses; cupro-nickel and nickel-silver alloys were corroded about to the same extent as the brasses. Alloys that were practically unattacked by the acid mine waters include a high chromium steel, two highly alloyed chromium-nickel-silicon steels, a nickel-chromium-iron alloy, and a high-silicon cast iron. These resistant materials possess certain disadvantages for general use in coal mine equipment, such as the brittleness and hardness of the high-silicon cast iron and the relatively high cost of the others. However, these resistant materials should prove satisfactory for use in such pump parts and other equipment where these factors are not a serious consideration.

The investigation described in this bulletin was conducted by the Co-operative Mining Courses of the Department of Mining of the Carnegie Institute of Technology and the Pittsburgh Experiment Station of the U. S. Bureau of Mines, in co-operation with the coal-mining industry of western Pennsylvania. The investigators were W. A. Selvig, assistant Analytical Chemist, U. S. Bureau of Mines, and George M. Enos, Research Fellow, Carnegie Institute of Technology.

Federated American Engineering Societies. The Annual Number of their Bulletin giving a history and review of the work of these societies.

GOVERNMENT PUBLICATIONS

Production and Consumption of Primary Zinc in the United States, 1919-1922, by C. E. Siebenthal and A. Stoll, U. S. Geological Survey, Washington, D. C.

The World's Production of Tin, U. S. Geological Survey, Washington, D. C.

The Wire Industry in 1921, Department of Commerce, Washington, D. C.

Antimony in 1921, by F. C. Schrader. U. S. Geological Survey, Washington, D. C.

Reports of Investigations—Bureau of Mines, Washington, D. C. A subject list of reports of investigations issued during 1922.

New Books

Metals and Their Alloys, by Charles Vickers. Published by the H. C. Baird & Company, 2 West 45th street, New York. Size 6 x 9, 760 pages. Price, payable in advance, $7.50. For sale by THE METAL INDUSTRY.

Although this volume is partly based on metallic alloys by Brannt, the revision has evidently been so complete that a new book has resulted. The author covers first the metallic elements, then the history, production methods, properties and uses of said elements. He goes on to alloys, still in a general way touching on their history, fundamentals, definitions and "groups." He takes up characteristics of alloys, the art of alloying and melting which includes the equipment necessary and even takes up in detail various important metals, such as copper, aluminum, etc., and their alloys.

A book of this sort necessarily covers a wide field which it is no mean task to attempt. Especially during the last twenty-five years the numbers and uses of alloys has been such as to hold back any but the boldest. Mr. Vickers has made such an attempt and it is on the whole creditable. "Metals and Their Alloys" is not a great book or an exhaustive work in any sense of the word, but it is valuable in its way and will undoubtedly prove useful.

Those chapters which deal with general aspects and the scientific backgrounds are a little weak. The definitions are somewhat vague, hardly scientific and perhaps in some cases a little inaccurate. The material on history, production methods, properties and uses of the elements is evidently a compilation and not the work of one who has made such studies his lifelong business. There are large gaps. For real information on the topics covered by this chapter, the reader would have to go to the work of Hofman or others similar.

When Mr. Vickers takes up the practical aspects of alloys and alloy manufacture, he is distinctly at home. He shows an intimate knowledge of the works of the non-ferrous foundry or alloying plant. It is interesting to note that the chapter on Aluminum bronze (which, by the way, is excellent) is given almost as much space as the two chapters on Copper and Its Alloys and Aluminum and Its Alloys put together. Although aluminum bronze may some day be a material of great importance, at the present time its manufacture and uses are considerably restricted by the difficulty of handling and it is very doubtful if it is of as much importance as all other copper and aluminum alloys put together.

Another point which will come up in the reader's mind is that in a discussion of brass for rolling purposes (and even for foundry purposes) when electric furnaces were mentioned, the Ajax-Wyatt was left out completely, in fact, not even mentioned.

The book was evidently written almost entirely from personal practical experience. References, particularly modern references seem to have played a comparatively minor part. There are bound to be gaps in such a work; no one man in any length of time can possibly have had enough personal experience to cover the entire field of non-ferrous metals. Moreover, citations from catalogues seem to play almost as important a part as those from whatever text-books were used.

"Metals and Their Alloys" is, as has been said before, a useful book, providing it is used for its chapters on the practical handling of metals and their mixtures. The best of these chapters are: Aluminum Bronze, Phosphor and Silicon Bronzes, Steam Metals and Red Brass, Steam and Electric Railroad Alloys, Manganese Bronze and White Brass, Brass for Sand Casting.

Mastering Power Production, by W. N. Polakov. Published by the Engineering Magazine. Size 6 x 9, 455 pages. Price payable in advance $5.00. For sale by THE METAL INDUSTRY.

This work covers a very broad field, and in its method manages to cover an even broader field than most works of similar character would, in describing the methods of producing power. It goes into the ramifications of the power field and covers not only the technique of power production, but the managerial, economic aspects and also the problem of better human relations in the power plant and factory.

Points in this work which would be of interest to metal manufacturers are largely those which treat of the methods of handling power problems which come up when the power plant is a department of the entire manufacturing plant. The power problem, particularly now that electric furnaces have become such a vital factor, has been becoming more and more important. It is commonly known that the high cost of power has prevented many prospective users of electric furnaces from installing them. Many believe that the power question will have to be straightened out before electric furnaces can assume their rightful place, in the foundry industry for example.

The author divides the topic into three elements—plant, material and personnel. The chapters on the location and equipment of plants will interest the power plant operator and the chapters on material, maintenance, labor problems and compensation. The chapter on processes and analyses of performance and experience should be read by every manufacturer who makes even a part of his own power. The author is a consulting engineer of standing, with wide experience in the power field, and his methods of checking productions and costs against predetermined standards are in successful operation.

It is a very interesting book from a number of viewpoints.

American Society for Testing Materials—Annual Proceedings. Published by the American Society for Testing Materials. Price payable in advance $6.00 in paper, $6.50 in cloth and $8.00 in half-leather binding. For sale by THE METAL INDUSTRY.

This volume is issued in two parts:

Part 1. (1023 pp.) Contains the annual reports of 34 of the standing committees of the Society, together with the discussion thereon at the annual meeting, and 84 tentative standards which have either been revised or are published for the first time.

Part 2. (591 pp.) Contains 36 technical papers with the discussion, the annual address of the president and the annual report of the Executive Committee.

The technical papers contain valuable information on results of investigations by experts in the field of engineering materials and the reports of the Committees cover Ferrous and Non-Ferrous Metals, Cement, Ceramics, Concrete, Gypsum, Lime, Preservative Coatings, Petroleum Products, Road Materials, Coal and Coke, Waterproofing Materials, Electrical Insulating Materials, Shipping Containers, Rubber Products, Methods of Testing and Nomenclature and Definitions.

Metallography and Macrography, by Guillet and Portevin, translated by L. Taverner. Published by McGraw-Hill Book Company, New York. Size 6 x 9½, 289 pages. Price, payable in advance $6.00. For sale by THE METAL INDUSTRY.

The work of Professors Guillet and Portevin is already known to all metallurgists regardless of the language which they speak. This book is put forth as a text-book and work of reference to include the theoretical and practical sides of metallurgy. The authors have kept clearly in mind the facts that the aim and the ultimate end of theoretical work on metals is the application of their findings to industry. This makes the book particularly attractive to men engaged in manufacturing and using metals.

It is needless to state that the work can be considered standard for the laboratory technician. In the first few chapters on metallography and the technique of making photomicrographs, the authors, with the aid of excellent translating have written an extraordinarily clear and lucid manual of laboratory practice. Their chapter on the theory of metallography can be understood and appreciated by anyone whether he had had any laboratory training or not. It would be advisable for anyone using this work as a text-book to master the introductory chapters thoroughly then proceed to the particular alloys in which he was interested.

A considerable amount of space is devoted to non-ferrous metals and alloys, covering this field, not only broadly, but in detail. There are three final chapters on macrography which are also very valuable. The book can be unhesitatingly recommended to everyone interested in metals from any angle.

SHOP PROBLEMS

IN THIS DEPARTMENT WE ANSWER QUESTIONS RELATING TO SHOP PRACTICE

ASSOCIATE EDITORS { JESSE L. JONES, Metallurgical; WILLIAM J. REARDON, Foundry; PETER W. BLAIR, Mechanical; LOUIS J. KROM, Rolling Mill; CHARLES H. PROCTOR, Plating-Chemical; R. E. SEARCH, Exchange-Research

ALUMINUM HOLLOW-WARE MIXTURE

Q.—What is a good mixture for aluminum hollow-ware containing iron?

A.—There are a number of mixtures on the market that contain iron. The one most in use contains 1% iron, and has a tendency to reduce shrinkage, and also gives a white color to the alloy. This mixture is made as follows:

Make a hardener consisting of

Copper	40 lbs.
Soft iron	10 lbs.

Get the copper good and hot and add the iron in the form of tin plate. Stir well and then add the aluminum, pour in ingots, and use in the following manner:

Melt 84 lbs. of aluminum
and add 16 lbs. of hardener.

For this class of work the best results are obtained by using virgin metal.

Another good mixture for this class of work consists of

Aluminum	94%
Copper	5%
Magnesium	1%

—W. J. R. Problem 3,183.

BARREL NICKEL

Q.—Would you kindly advise me what causes my solution to plate dark? I have tried the following nickel solution for barrel plating and find it unsatisfactory.

Double nickel salts	8 ozs.
Single nickel salts	2 ozs.
Boracic acid	3 ozs.
Sal ammoniac	2 ozs.
Muriatic acid	⅛ to ¼ oz.
Water	1 gallon

The first few loads came out fine but after that I got a dark deposit. I have added single salts and sal ammoniac, boracic acid and about 8 oz. of muriatic, but failed to bring up a white color. The anodes seem to give up their nickel readily and I use 6 to 8 volts and 150 amperes. The connecting rods for this barrel are submerged in solution while plating and nickel plate readily. Could it be possible that I am not getting enough current on that account? I acid dip them every day. I plate about 150 to 200 lbs. of brass.

A.—The formula you give is good for still plating, but not for barrel plating.

The proportions for a mechanical solution should be about double or approximate the following formula:

Water	1 gallon
Double nickel alts	16 ozs.
Single nickel salts	4 ozs.
Boracic acid	4 ozs.
Sal ammoniac	4 ozs.
Muriatic acid	¼ oz.

Voltage 8 to 10. Temperature not less than 70 deg. F. The mere fact that the first few batches of work came out excellent indicates that the composition of the solution was nearly correct but too weak in metal to keep up deposition. It is possible that if you add about 8 ozs. single nickel salts and 2 to 3 ounces more sal ammoniac per gallon of solution, it will give the desired results. However, the temperature of 70 deg. F. to 80 deg. F. should be maintained. Cold solutions are too inactive. The voltage necessary for mechanical barrel solutions for nickel should not be less than 8, preferably 10, for rapid results.—C. H. P. Problem 3,184.

BRASS DEPOSITION

Q.—I have a brass solution which turns red. How can I fix it?

A.—We presume that it is the brass deposit that turns red, not the solution. If this is the case, then it would infer that your solution is too high in zinc in proportion to the copper content.

Make a trial test with 5 or 10 gallons of the solution. To each gallon add 1 ounce sodium cyanide and 1 ounce bisulphite of soda. Run the test solution for a short time. If the brass deposit shows a more distinct red following the additions prescribed, then add 26% water ammonia until the brass deposit becomes normal. Start with ¼ ounce per gallon and repeat; possibly ¾ ounces per gallon will be required.

Add a little bisulphite of soda to the solution occasionally and a small amount of ammonia. These additions will enable you to maintain a uniform brass deposit providing you add sufficient free cyanide to the solution to keep the anodes clean.

Not more than ¼ to ½ ounce sodium cyanide should be added to the solution per gallon at one time to keep up anode reduction. —C. H. P. Problem 3,185.

CONVERTING ACID COPPER TO CYANIDE

Q.—How can I turn my acid copper solution into a cyanide solution?

A.—The only way you can convert an acid copper solution to a copper cyanide solution is partly to neutralize it with soda ash 58%. Then take up the partly precipitated copper and converted sodium sulphate with sodium cyanide until the solution becomes clear and workable under the usual current conditions. However, you will find that you have not saved any money by so converting. A copper solution prepared as follows would be less costly and superior in every way:

Water	1 gallon
Sodium Cyanide	5 ozs.
Copper Cyanide	4 ozs.
Soda Ash, 58%	2½ ozs.
Hyposulphite of Soda	1/32 oz.

The solution so prepared should be operated at 120° Fah. at 3½ to 4 volts with copper anodes. Use one-third of the water at 160 Fah. to dissolve the cyanide and copper cyanide. Then add the balance of the water warm; then follow up with the soda ash and hyposulphite of soda.—C. H. P. Problem 3,186.

COPPER ON FLAKE GRAPHITE

Q.—How can I copper plate flake graphite?

A.—The copper plating of flake graphite is somewhat of a difficult operation in our estimation, under its usual plating methods it could not be done.

It is possible, however, that the electrotypers' method of coppering graphite, coated wax impressions could be used. We would suggest that you prepare a solution of copper sulphate in hot water so that upon cooling a fairly dense copper sulphate solution results. To this solution add small portions of sulphuric acid. The amount cannot be determined by us. Experiment will determine this for you. Start with a minimum of ½ oz. per quart of solution and increase if necessary. The graphite should be placed in a shallow enameled steel or porcelain receptacle, so that only a small amount of solution will be required to cover it. Now take a clean steel rod and run through the graphite to obtain a thorough contact of the graphite with the steel. The action of the steel will precipitate the copper in the graphite. The electrotyper uses finely powdered iron, however, and it is possible you will have to use the same method. In such an event, the copper coated graphite would have to be thoroughly washed in water to free it from the copper sulphate solution, and then to remove the iron filings a strong magnet would have to be used.—C. H. P. Problem 3,187.

EXCESS METAL DEPOSIT

Q.—Our oxidizing department consists of a 1000 amp, outfit. We recently changed over from a hot combination cleaning and plating solution in one tank to a separate cleaning and plating solution in different tanks. The plating solution now used consists of

1 gal. Water
12 oz. Sodium Cyanide
2 oz. Soda Ash

Copper Carbonate added until a deposit appears.

This solution is kept at 180 to 200 deg. F. Tank holds 180 gallons, requiring about 30 lbs. copper carbonate and is lined with oval anodes.

One of our principal products to be copper oxidized is a cup shaped disc, three inches diameter, one-half inch deep. We have racks on which twenty of these discs hang, which is dipped first into the electric cleaning solution, then through cold water rinse into 25% muriatic acid pickling solution, through cold rinse into the hot copper plating tank, three to five minutes. Then through cold rinse and hot rinse into the liver sulphur, through cold and hot rinse, to sawdust.

With this method, just lately adopted, one of the difficulties which has developed is that of an excess copper coating on the racks, a sample of which we are sending to you under separate cover. A coating like this sample takes place in a few days run and is proving to be a considerable expense. How can we overcome this difficulty?

A.—The only possible way to prevent deposition of copper on your plating racks is to insulate them at all points except at the points of contact of the articles to be copper-plated. There is no type of asphaltum lacquer or varnish that can be used as an insulating factor upon your plating racks, with your type of solution. The excessive amount of sodium cyanide that you use in proportion to the metal content of the solution, and the high temperature, 200 deg. Fahr. (within 12 deg. of the boiling point of water) make such insulating materials impossible to use.

The best suggestion that we can make is to use rubber tubing as an insulator upon the wire part of the frames. Small diameter rubber tube can be used without splitting the tube. A little soapstone powder will assist you in pulling the tube over the wire parts of the frame. For the larger sections of the frame or rack, the tube would have to be split and notched as required to cover the rack as completely as possible. The tube could be fastened to the racks by the aid of soft steel wire. Some platers use thin hard wood strips on the main portion of their plating racks, with rubber tube, as outlined, on the wire portions.

These are the only suggestions we can make to help you.

A change in the proportions of your copper plating solution would prevent to some extent the excessive deposition of the copper. Your high cyanide content gives an unusual "throwing power" to the solution, which in our opinion is not necessary for your class of product.—C. H. P. Problem 3,188.

HIGH POLISH ON STEEL

Q.—Have you an article on the practical method for producing a high polish on hardened steel. If you have anything that would be of interest kindly advise or forward if you wish.

A.—The production of a high polish upon hardened steel is one of manipulation. Most firms develop their own methods, based upon continuous experience and experiment. The basic surface of the steel depends a good deal upon the several manipulations to be followed out, presuming the surface is smooth and free from deep scratches. Then the first operation should commence with a preliminary polishing by the aid of 160 alundum or a similar abrasive using solid wooden wheels, leather covered or compressed canvas wheels coated with the abrasive. The second operation should consist of polishing with Tampico Wheels, using as the abrasive, flour emery of the finest grade and tripoli. The flour emery should be in the form of an emery paste put up specially for the purpose in stick form.

The third operation should consist of buffing, using cloth wheels made up in the form of buffs either from sections of cloth or the commercial sewed buffs that are put up in sections. A crucus rouge composition should be used as the polishing factor. The fourth operation should consist of the final buffing operation, using for this purpose sheepskin buffs and either the finest of jeweler's rouge composition or Vienna lime. If the hardened steel surface should contain scratches too deep to be polished out with the 100 grade alundum or Turkish emery, then a coarser grade will, of necessity, have to be used, possibly 120 grade. If the articles to be polished are small then it is possible that walrus hide polishing wheels can be used to an advantage instead of the wooden leather covered wheels or the compressed canvas wheels.—C. H. P. Problem 3,189.

NICKEL BRONZE

Q.—One of our customers has requested us to furnish him with a nickel bronze casting for heavy rolling mill work, and frankly all our rolling mill brasses are either made up of the highest grade of phospher bronze, using 10% to 12% of tin or special mixtures of our customers, and we are at a loss to know what to supply against nickel bronze for rolling mill work. Can you help us out?

A.—There are a number of mixtures used for such work. One that has given good results consist of:

Copper	83%
Nickel	3%
Zinc	4%
Tin	10%

This may be what is desired. The mixture is made by making a hardener of the following:

HARDENER

Tin	65%
Nickel	30%
30% Manganese Copper	5%

Melt the nickel and tin, and add the manganese copper. Pour in ingots, and then use as follows:

Copper	83%
Hardener	10%
Tin	3½%
Zinc	3½%

This mixture is said to be very satisfactory where heavy pressure is applied.—W. J. R. Problem 3,190.

WHITE METALS

Q.—What is the composition of white brass? Also of German silver?

A.—There are a number of so-called white brass mixtures in the market styled white brass. One mixture called Parson's white brass is a composition of zinc and tin and is used for bearings. Considerable skill is necessary to handle this mixture successfully. The mixture consists of 63 tin, 35 zinc, 1.75 copper and .25 of aluminum. High grade zinc is used in the mixture. Another white brass for automobile door handles consists of 50.34 copper, 19.31 nickel, 24.14 zinc, 3.45 lead and 2.76 aluminum. Another white brass mixture that is made and called silver metal, consists of 100 pounds copper, 32 pounds flux, 7 pounds zinc. The flux consists of the following:

Salt petre	5	lbs.
Sal Ammoniac	10	"
Lime	1	"
Ferro-Manganese	100	" pulverized.

The copper is melted first and the flux added a little at a time, then the zinc. For sand castings a small amount of aluminum is added. It is not unusual to obtain a tensile strength of 60,000 pounds per square inch, 35 per cent elongation in 2 inches.

A good casting German silver mixture for sand castings consists of:

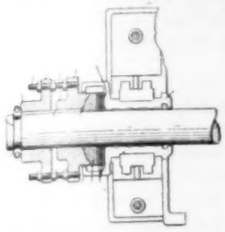
Copper	55
Nickel	20
Zinc	24
Aluminum	1

Like all German silver mixtures the success to a large extent is due to the handling in the melting operation. A skilled melter is necessary and you can save his wages many times in a day.—W. J. R. Problem 3,191.

PATENTS

A REVIEW OF CURRENT PATENTS OF INTEREST

1,439,341. December 19, 1922. **Rolling-Mill Drive.** Howard H. Talbot, Wooster, Ohio, assignor, by mesne assignments, to Mackintosh-Hemphill Company, Pittsburgh, Pa.



This invention relates to an improvement in means for taking up the thrust of the drive shaft or shafts of a continuous rolling mill in which the roll shafts are geared through bevel gearing.

1,439,447. December 19, 1922. **Oxidation of Ferrous Surfaces.** Tito Rondelli of Turin, and Quirino Sestini, of Bergamo, Italy, assignors of one-third of Sestron (Foreign Patents) Limited, London, England.

According to this invention the improved process for the oxidation of ferrous surfaces consists in immersing the object, the surface of which is to be oxidized, in an alkaline bath having in solution therein metal, such, for example, as lead, which behaves electro-negatively towards iron, so as to produce oxidation of the iron or steel surface, with separation of the metal of the oxide, without use of an electric current.

1,439,610. December 19, 1922. **Method of Zinc Coating Metal Surfaces and Zinc Paint Therefor.** Howard N. Copthorne, Chicago, Ill.

One object of the present invention is to apply to metal objects, such, for instance, as iron or steel smoke stacks, a protective coating of metallic zinc that will adhere to the metal of the object notwithstanding high temperatures to which the object may be subjected in use.

1,439,780. December 26, 1922. **Rust Remover.** Glen Lenardo Williams, Detroit, Mich.

In the rust remover involving this invention, mineral or vegetable acids are mixed with metallic salts in a medium consisting of a colloidal carbohydrate material. The term "carbohydrate" is to be taken as including the sugars, starches and celluloses. A typical substance is one of the starches, heated in water until the small cells or granules swell to form a gelatinous paste.

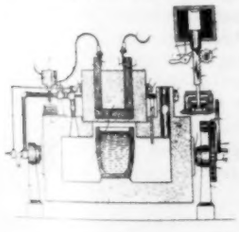
1,439,865. December 26, 1922. **Nickel Alloy.** Leon Cammen, New York, N. Y., assignor to the International Nickel Company, New York, N. Y.

This invention refers particularly to ternary alloys of nickel, copper and aluminum, wherein the aluminum is present not merely as a residue of the process of deoxidation, but a necessary constituent of the alloy.

1,440,092. December 26, 1922. **Process of Forming a Rust-Resistant Coating on Metal.** Alfred Mai, Munich, Germany.

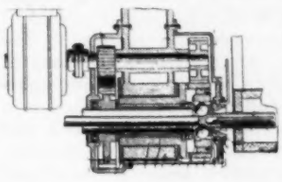
This invention relates to an improved process of forming a rust resistant coating or finish on iron or steel, or alloys of the same, by means of hot alkaline baths under addition of oxidizing agents and the object of this invention is to provide a method in which certain disadvantages of existing methods are avoided and certain advantages, as hereinafter set forth, are attained.

1,440,515. January 2, 1923. **Melting Furnace.** Holley G. Wellman and Charles D. Gilpin, Cleveland, Ohio.



This invention relates to furnaces, and particularly to devices of this character adapted to melt non-ferrous metals for making bronze, brass and similar castings. The purpose of the invention is to provide a furnace in which gas or oil can be utilized as the heating medium, combined with electrical heating.

1,440,527. January 2, 1923. **Drawing Monel and Other Hard Metals.** Louis H. Brinkman, Glenridge, N. J., assignor, by mesne assignments, to General Seamless Tube Company, Bloomfield, N. J.



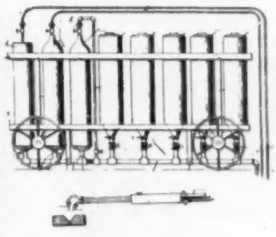
This invention relates to the use of dies wherein balls are the members operating upon the work.

1,440,923. January 2, 1923. **Die-Casting Mold.** Adolph W. Lemme, Chicago, Ill., assignor to Chicago Bearing Metal Company, Chicago, Ill.

This invention relates to improvements in molds, and has reference more particularly to improvements in that class of machine molds designed to produce articles in the nature of die castings.

1,441,094. January 2, 1923. **Metal Coating and Welding Apparatus.** Alexander F. Jenkins, Baltimore, Md.

It is the object of this invention to provide an improved apparatus for metal welding and coating. The present invention relates particularly to the type of metal welding and coating apparatus in which the metal used in forming the weld or the coat is conveyed to the heating or welding flame, or to the work adjacent the heating or welding flame, in granular form.



1,441,567. January 9, 1923. **Electrode.** Colin G. Fink, Yonkers, N. Y., assignor to Chile Exploration Company, New York, N. Y.

This invention relates to electrodes and more particularly to electrodes adapted to be used as insoluble anodes in the electrodeposition of metals such as copper. The invention has for its object the provision of an improved electrode for use in the electro-deposition of metals and more particularly the provision of an insoluble anode for use in the commercial electro-deposition of copper, especially from copper sulfate electrolytes containing chlorides and nitrates.

1,441,568. January 9, 1923. **Electrodeposition of Copper.** Colin G. Fink, Yonkers, N. Y., assignor to Chile Exploration Company, New York, N. Y.

The invention is based upon the discovery that by using an anode consisting principally of copper, silicon and lead, the electro-deposition of copper can be carried out with a remarkably low corrosion loss or disintegration of the anode, without objectionable contamination of the electrolyte, with low anodic potential and low power consumption, with high current efficiency, etc.

1,442,742. January 16, 1923. **Alloy.** Joseph C. Stone, Belmont, Mass.

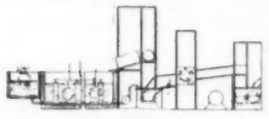
It has been discovered that a very superior alloy can be made of copper, nickel, lead and tin in substantially the following proportions: For castings, such for instance, as pipe fittings for dairies, I prefer a composition consisting of approximately

73 %	Copper
17½%	Nickel
3½%	Tin
6 %	Lead

1,442,243. January 16, 1923. **Process for Cleaning Scale from Metals.** George A. Avery and Frederick Bamblett, Detroit, Mich.

This invention relates to a process for cleaning scale from metals, and more particularly to a method of removing scale from hardened gears.

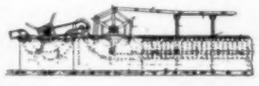
1,442,437. January 16, 1923. **Process of Galvanizing Wheel Rims.** Lewis V. Mather, Detroit, Mich.



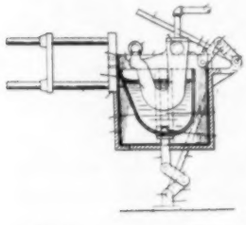
The invention relates to the art of electrolytic depositions of metal to form a protecting coating, and the present invention is more particularly designed for use in the coating of metallic wheel rims with a protecting metal, although the same method is applicable to other articles.

1,442,438. January 16, 1923. **Electroplating Apparatus.** Lewis V. Mather, Detroit, Mich.

The invention relates to apparatus for the electro-plating of articles and it is the object of the invention to obtain a construction with which the articles to be plated are progressively advanced through the electrolytic bath and are maintained in constant electrical connection with the cathode during advancement. It is a further object to avoid deposition of metal on the cathode bus bar.



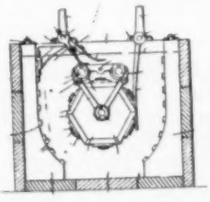
1,442,479. January 16, 1923. **Die-Casting Apparatus.** John Kralund and Clarence H. Duckworth, Brooklyn, N. Y., assignors to Doehler Die Casting Company, Brooklyn, N. Y.



By the invention, a movable member, which may be termed a carrier or ladle, is made use of, the mechanism being so arranged that the nozzle or mouth-piece of this device is first immersed in the molten metal so that a charge of the same runs into its interior, after which the carrier is moved to cause its mouth to align accurately with the gate or opening of the die. As soon as this is accomplished compressed air or other suitable gas is forced through the carrier to deliver the charge of metal into the die.

1,442,514. January 16, 1923. **Electroplating Machine.** Frank J. Bell, Cleveland, Ohio.

The object of the invention is to provide an improved machine with which the operations referred to can be performed on the various kinds of articles indicated, and a plurality of rims for example may be galvanized at the same time, on both inside and outside, the machine comprising a power driven carrier on which the articles are mounted so that they can be entirely immersed in the solution. Furthermore the construction is such that the rims or rings can be placed on their carrier without splitting, being slipped on or off endwise of the drum and carriers.



1,442,735. January 16, 1923. **Lubricating System for Wire-Drawing Machines.** William D. Pierson, Waterbury, Conn., assignor to the Waterbury Farrel Foundry and Machine Company, Waterbury, Conn.

This invention relates to a new and useful oiling system for wire drawing machines and has for its object, among other things, to provide a system whereby all of the bearings and several gears may be kept constantly provided with a lubricant, which may be used over and over again and obtained either from a supply exterior to the machine or from a suitable reservoir connected with the machine and into which the lubricant drains after being used.

1,443,816. January 30, 1923. **Electric Furnace.** F. A. J. FitzGerald, Niagara Falls, N. Y., assignor to Buffalo Apparatus Corporation, Buffalo, N. Y.

This invention relates generally to electric furnaces and more particularly to a furnace of the arc type which is heated by radiation from a single phase arc. It is well known that in furnaces of this type the arc is formed between two opposing carbon electrodes. It has been found that it is very important that the electrodes be kept in exact alinement with each other if the furnace is to work in a satisfactory and efficient manner.

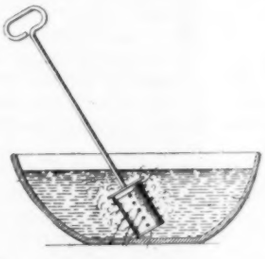
1,443,762. January 30, 1923. **Sand-Blast Apparatus.** Charles G. Smith, Philadelphia, Pa.

This invention relates to sand blast apparatus, and it relates more particularly to an improved form of pressure tank and the associated parts, including the hopper and the means for permitting the sand to pass from the hopper to the tank.

1,443,580. January 30, 1923. **Electric Furnace.** George M. Little, Pittsburgh, Pa., assignor to Westinghouse Electric & Manufacturing Company.

This invention relates to electrically-heated apparatus and particularly to electric-resistor furnaces, and it has for one of its objects to provide a heating element, comprising a plurality of units, and to so mount it in a furnace chamber, out of contact with the furnace walls, as to permit of maintaining a temperature of 2500° C. or over, in such chamber and in which a relatively large energy input may be maintained uninterruptedly for relatively long periods of time without material damage to any part of the furnace.

1,443,920. January 30, 1923. **Metal - Refining Apparatus.** Abraham Hoyt Levy, New York, N. Y.



This invention relates to improvements in metal-refining apparatus, and particularly to improvements in means for holding a flux-container beneath the molten metal in a melting pot.

1,444,113. February 6, 1923. **Process for Plating Metal on Nonmetallic Surfaces.** Ernest F. Dietrich, Chicago, Ill.

This invention relates to improvements in the process for plating metal on non-metallic surfaces, such as china, porcelain, glass, or the like, and its consists in the steps hereinafter described and the combinations, constructions, and arrangements herein described and claimed.

An object of the invention is to provide a process of the character described in which metals, such as silver, gold, or nickel, may be permanently deposited on non-metallic surfaces by an electro-plating bath.

1,444,479. February 6, 1923. **Abrasive Composition.** Hans M. Olson, Burbank, Calif.

This invention relates to an abrasive composition and to the method of making same.

It is the object of this invention to provide an abrasive substance and a means for forming same from diatomaceous earth by adding thereto such ingredients as when subjected to high temperature as to convert the natural soft non-crystalline formation thereof into hard crystalline formation.

1,444,270. February 6, 1923. **Process of Manufacture of Rough Pieces for Brass Tubes.** Maurice Pinchart-Deny and Lucien Labourot, Paris, France.

The rough pieces used for the manufacture of brass tubes consist of short and thick tubes which are supplied to the tube drawing operators who are engaged in the cold drawing process for the manufacture of tubes to be supplied to the industries, these having a variety of shapes and being made as a general rule with thin walls.

The rough pieces for iron or copper tubes are easily prepared by the first pass, in the hot state, by pressing or by the Mannesmann process.

EQUIPMENT

NEW AND USEFUL DEVICES, MACHINERY AND SUPPLIES OF INTEREST

Notes on B & M Metal, An Aluminum Bronze

Production, Properties and Uses of This Metal

Written for The Metal Industry by E. S. WHEELER, Eastern Sales Representative of the Wheeling Bronz Casting Company

Aluminum bronze has been known as an alloy for a good many years but has not found the market it deserves because the manufacturers of this metal had so much difficulty in producing it that it was necessary to make the price prohibitive. This difficulty of production is caused by the aluminum oxide and occluded gases, formed during the melting operation, being hard to remove. Much time and money has been spent to find a deoxidizer suitable for this purpose. Few satisfactory deoxidizers have, as yet, been found with the result that there are not at present many producers of sound, uniform aluminum bronze castings.

The Wheeling Bronze Casting Company, Inc., of Wheeling, West Virginia, claims to have discovered such a deoxidizer and is making (among other alloys) an aluminum bronze alloy called B & M Metal which is uniformly sound and yet not exorbitant in price. They have recently acquired a new and larger foundry than the one in which they first started production and are now adding to it a rolling mill with which they are planning to turn out hot rolled bars and rods.

When the metal in the furnace is ready to cast great care is taken in pouring. As is common with all aluminum bronzes, B & M Metal has a large shrinkage, the pattern-makers allowance for this being 0.22 inches per foot. This makes it necessary to pour slowly yet uniformly so that, as the metal contracts on freezing, new metal will be added to take the place of that lost by contraction. The molten metal is stirred very little as any disturbance of it would cause some oxidation. But if it is allowed to remain at rest very little oxide would form as the surface would be protected by the film of dross already on it. For the same reason the sand in the moulds is thoroughly dried before pouring; wet sand tends to cause the metal to boil, thereby allowing a greater amount of the metal to come in contact with the air.

Figure 1 shows a B & M Metal pickling crate, complete with fingers, hooks, eye bars, nuts and washers used by one of the large sheet steel manufacturers for pickling steel sheets.

Salt water has practically no effect on B & M Metal. In some tests conducted by Messrs. Vivian and Sons[1] on several metals they found that iron when immersed in salt water lost 0.0090 lbs. per sq. ft. per month; 1% aluminum-copper alloy lost 0.0025 lbs. per sq. ft. per month; copper lost 0.0026 lbs. per sq. ft. per month; Muntz Metal lost 0.0013 lbs. per sq. ft. per month; while 10% aluminum-copper lost only 0.0008 lbs. per sq. ft. per month. The last named metal is of practically the same composition as B & M Metal. This indicates that a metal similar to B & M Metal if in the form of a plate ¼" thick by 12" square would last 1,000 years before the salt water completely corroded it. The places where it could be used in connection with salt water are numerous and include salt water pump parts, ship trim, valves, cut nails for wooden boat construction, propellers, propeller shafting, bushings and many similar places.

It has also been found of use around salt producing plants. Suitable materials have been hard to find by these companies due to the extremely severe corrosive conditions. But there are several who are now using B & M Metal parts with entire satisfaction. The forms in which it is used consist of sprocket chains, rods and castings of various shapes.

The following description of this metal may be of interest. The color of B & M Metal is golden aluminum bronze of the same composition being called at times aluminum gold. The averages of several tensile tests made on cast B & M Metal by the Wheeling Mold & Foundry Company give a fair idea of its strength. These results are as follows:

Yield point	33,330 lbs. per sq. in.
Ultimate strength	67,748 lbs. per sq. in.
Elongation in 2 inches	41.25%
Reduction of area	37.25%

The fracture was in each case one-half cup, of fine, uniform texture and crystalline. Its modulus of elasticity, as determined by the Bureau of Standards, is 16,200,000 lbs. per sq. in. (see Figure 2). The Bureau of Standards also determined the hardness of cast B & M Metal, finding the average Brinell hardness number of six tests to be 114.6 and the average Shore scleroscope hardness of sixteen tests to be 24.65.[2] The Brinell hardness number of aluminum bronze rods rolled to 13/16" diameter has been found to be in the neighborhood of 200.[3]

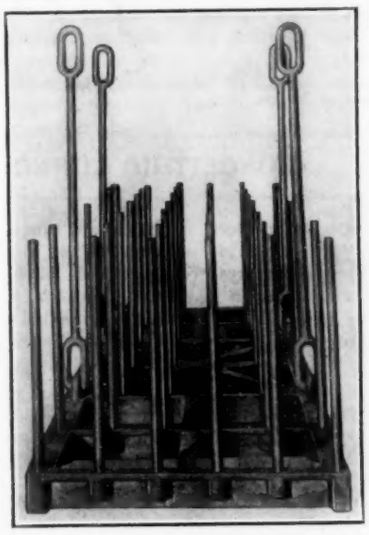


FIG. 1. PICKLING GATE

An interesting feature of this alloy is that it can be heat treated to give a much higher tensile strength. Experiments[1] have shown that a sand casting having a yield point of 25,000 lbs. per sq. in., an ultimate strength of 71,000 lbs. per sq. in. and an elongation in 2" of 21.7% can be made to have, by heating to 800° C. (1,472° F.) and quenching in water, a yield point of 50,000 lbs. per sq. in., an ultimate strength of 112,000 lbs. per sq. in. and an elongation of 3.0%.

Another interesting feature is that its mechanical properties are similar to those of 0.35% carbon Swedish Bessemer steel.[1] The yield point of the aluminum bronze similar to B & M Metal appears to be lower than that of the Swedish Bessemer steel. However, the yield point of the latter as obtained on the tensile testing machine is usually an artificial figure, the true yield point being very close to that of aluminum bronze as is shown in the following table:

TENSION TEST

	True Yield Point[3] lbs. per sq. in.	Ultimate Strength lbs. per sq. in.	Elastic Ratio	Elong. in 2"
Steel (0.35% C.)	34,048	85,120	0.40	26.0%
Aluminum Bronze	33,152	85,344	0.39	28.8%

Another interesting similarity is shown in the following table which compares the alternating-stress tests of the two metals:

[1] See Eighth Report of Alloys Research Committee of the Institution of Mechanical Engineers of Great Britain.

[2] Bureau of Standards Test Tns268.26, Laboratory No. 1006b19.

[3] These figures are given in long tons per sq. in. in the report. One ton equals 2,240 lbs.

ALTERNATING-STRESS TEST

Maximum limit of resistance for one million reversals at 800 per minute, with a ratio of tension to compression of 1. 4.

Steel (0.35% C.)... 29.5
Aluminum Bronze. 28.3

A third test also shows how closely these two metals resemble each other. This was an impact test run on an Izod machine and the results are shown below:

IMPACT TEST

Foot-pounds absorbed on fracture (without deformation.)

Steel (0.35%)..... 4.3
Aluminum Bronze. 4.5

These tests were made on rolled material, the aluminum bronze being 1¼" diameter.

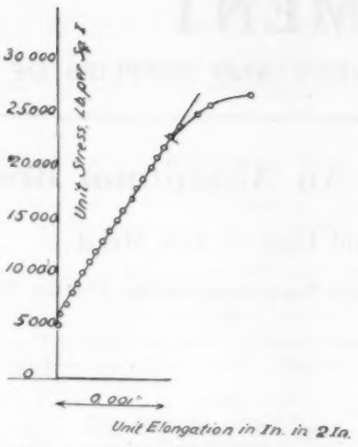


FIG. 2. ELONGATION OF B. & M. METAL

Mention has already been made above regarding the ability of this material to be hardened by heat treatment. Mr. W. M. Corse[4], in discussing this fact, points out that its hardness is also increased. He says that "heat treating this alloy to different temperatures up to 800° C. (1,472° F.) will give on quenching hardness numbers varying from 100 Brinell to 260 Brinell. This varies somewhat with the area of the cross section of the piece. Many uses immediately suggest themselves for bronzes with hardnesses above 100 Brinell, particularly, as happens in this case, if the bronze possesses good bearing qualities. We have seen bearings heat-treated in a manner similar to that mentioned above put into machinery running 20,000 R. P. M. and give excellent results. Softer bronzes were failures in such places because they would not hold their shape under the severe conditions named.

"Many places can be thought of where a bearing was to stand high compression as in a bridge. For such conditions a hard bronze is essential."

In the same paper Corse says that "another valuable property of the aluminum bronzes is their ability to withstand alternating stresses without showing fatigue. The samples tested by Messrs. Carpenter and Edwards and reported in the Eighth Report A. R. C.[5] constitute a record in this respect.

"Comparing aluminum bronze with manganese bronze of the same strength we found that aluminum bronze resisted stresses above its elastic limit for an average of 15 million reversals on a White-Souther machine, while manganese bronze broke at less than 1 million.

A metal of these properties has a wide field of usefulness as can easily be seen. B & M Metal has these properties and, moreover, is produced in sound castings which, as explained above, has been very difficult to do previously.

[4]A paper entitled "Aluminum Bronze Alloys" delivered at the Annual Meeting of the American Institute of Metals, 1915.

[5]Eighth Report of the Alloys Research Committee of the Institution of Mechanical Engineers of Great Britian.

MONOLITHIC LINING FOR BRASS FURNACES

In the past, foundry operators have experienced much trouble with fire brick linings in brass furnaces of the pit type. In these furnaces, the intense heat of the flames playing about the base of the crucible soon causes the corners of the bricks to crack, crumble and fall off. Even with the best of fire brick the joints soon cause trouble. Once the brick begin to crack deterioration is sudden and the necessity of relining is certain.

Plibrico, the manufacturers say, is a one-piece plastic lining that has no joints. It is applied, while plastic, with mallet and trowel. When baked, it forms a rocklike, gas and air-tight monolithic lining that resists temperatures to 3,100 deg. F. and that, it is stated, outlasts ordinary fire brick linings two to four times.

At the foundry of L. A. Cohn & Brother, Chicago, a battery of brass furnaces, as shown in the illustration, are lined with Plibrico. They say that they have used this lining for four years, that it is more satisfactory than fire brick, lasts longer and is easier to repair and patch.

The Jointless Fire Brick Company, Chicago, the manufacturers, will gladly send the 50-page catalog to any foundry operator.

PIT FURNACES LINED WITH PLIBRICO

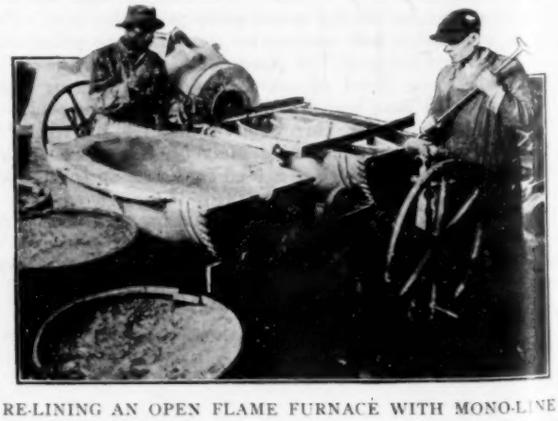
NEW REFRACTORY CEMENT

The Quigley Furnace Specialties Company, 26 Cortlandt Street, New York, is putting on the market a refractory concrete lining called Mono-Line, for patching ladles, pit furnaces, tilting crucible furnaces, open flame furnaces and furnace doors. It is a ganister which carries its own natural binder and is prepared by mixing approximately half a pail of water to each 200 pounds; let the mixture stand overnight so that the moisture may evenly penetrate the refractory.

Before being used the material should be worked over and well mixed, in order to get the best results. If a mixing pan is available, the work can be done much more quickly, particularly if large quantities are being handled.

It is stated that Mono-Line has a melting point beyond 3,300 deg. F.; a low coefficient of expansion; withstands abrasion of high velocity flames and resists slags and oxides.

The Quigley Company has issued Bulletin 70, describing Mono-Line and the methods of applying it.



RE-LINING AN OPEN FLAME FURNACE WITH MONO-LINE

ENGLISH ELECTRIC FURNACES

The Leeds Electrical Construction Company, Ltd., of Charmouth street, Leeds, England, is manufacturing electric furnaces for melting metal, which are called Lecfur furnaces. The metal is heated by conduction and radiation.

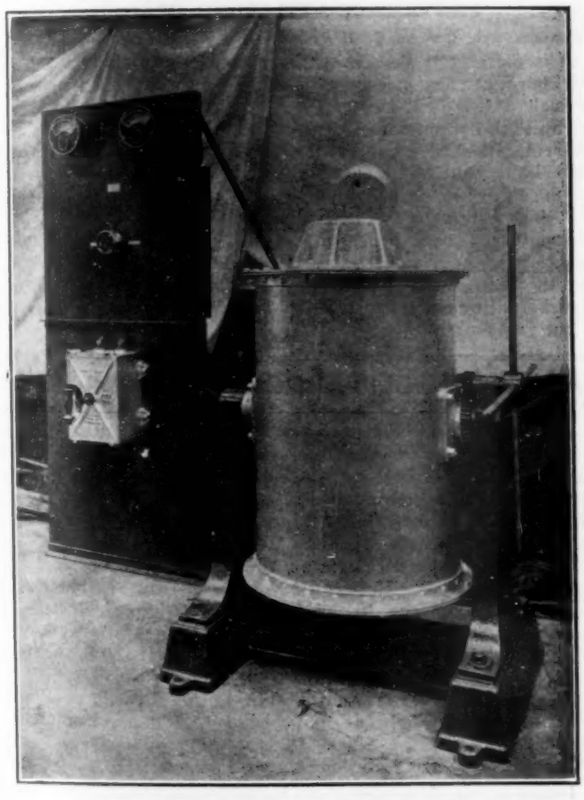
When melting commercial brass, the average consumption of electrical energy is claimed to be approximately 400 K.W.H. per ton of metal melted and poured.

In the melting of non-ferrous metals, it is very important that the atmosphere, time of melting and the temperature of the furnace should be under perfect control, because of the more volatile nature of the metal. It is stated that Lecfur type R. B. resistance furnaces fully comply with all these requirements.

The furnaces are constructed for operation on D.C. or single phase alternating current circuits up to 300 volts, and made in the following sizes:

Type	**Weight** of metal in lbs. per charge (brass)	Type	Weight in metal in lbs. per charge (brass)
R. B. 50	50	R. B. 150	150
R. B. 100	100	R. B. 300	300

The time required to melt a full charge in the above furnaces is dependent on the nature of the metal and the K.W. capacity of furnace, but when melting brass, the average time taken to melt a full charge is approximately 35 minutes. They are of the tilting type, arranged for pouring the metal directly into ladles or molds.



LECFUR TYPE R. B. ELECTRIC FURNACE

The illustration shows the arrangement of Lecfur Standard R.B. 50 type electric furnace, complete with control gear. It will be observed that the furnace is of the vertical cylindrical type, supported on cast iron stand and base plate, the tilting mechanism being arranged so that the furnace is self-sustaining in any position.

The melting chamber is composed of special refractory material of high thermal conductivity and low co-efficient of expansion. It is said to be capable of standing temperatures up to 1,600 deg. C., is chemically inert, and there is no re-action when melting metals.

The heating element is a special high temperature alloy (melting point 1,500 deg. C.) wound in intimate contact with the muffle or melting chamber.

All joints and electrical connections are eliminated in the construction of Lecfur furnaces. The melting chamber is supported between circular refractory discs capable of standing high temperatures without distortion or cracking, provision being made for expansion and contraction due to variation in temperatures.

The space between the refractory discs and the outer shell of the furnace body is filled with special lagging powder. This, it is stated, has extremely good heat insulating properties, reducing the loss of heat by radiation to a minimum, thereby obtaining high thermal efficiency.

Attached to the top plate of the furnace is a semi-circular casting, lined with refractory material, which serves as the pouring spout. This spout is heated by conduction of the furnace charge, and by this arrangement solidifying or cooling of the metal during pouring is obviated.

The door of the furnace consists of a circular casting, to which is attached refractory material, and is constructed so that practically an air-tight joint is obtained between the door and melting chamber. The door mechanism is operated by hand-wheel operating through machine-cut worm gearing.

The exterior of the furnace body is treated with aluminum paint, in order to reduce the loss of heat by radiation and improve the thermal efficiency.

A control panel, consisting of double pole switch and fuses (ironclad type), voltmeter, ammeter and temperature regulator mounted on slate base, is supplied as standard equipment with each furnace.

Pyrometer outfit, consisting of indicator mounted on control panel, complete with special Thermo-Couple, which can be used directly in the molten metal, can be supplied extra with each furnace.

CONVENTION EXHIBITS

Pangborn Corporation will occupy spaces 257, 258, 259, 260, 274, 275, 276, 277 and 288 at the American Foundrymen's Association Convention in Cleveland, April 28, May 3, 1923.

The exhibit will be operating and will include room sand-blast, hygienic cabinet sand-blast, rotary tables and barrel sand-blasts in various types and sizes. Samples of sand-blasted casting will be shown with illustrations of various types of equipment for different foundry products, and operator's protective clothing and Metal Abrasives.

The following officials and representatives will be in attendance: Thomas W. Pangborn, president; John C. Pangborn, vice-president; P. J. Potter, works manager; Foster J. Hull, mechanical engineer; H. D. Gates, sales manager; Geo. W. Cooley, Jesse J. Bowen, Roy C. Koch, Fred E. Wolf, Chas. T. Bird and W. C. Lytle, district sales engineers.

The exhibit of the **Hardinge Company** at the American Foundrymen's Association is to consist of small operating models of the Hardinge Conical Mill, together with installation photographs and descriptive layouts showing how the Hardinge Mill operates, and how it grinds the various classes of materials, such as graphite and coal for foundry facings, and slag sweepings and foundry waste for the recovery of brass, zinc, aluminum and other materials. G. F. Metz will be in charge of the Exhibit.

CORRECTION

In our March, 1923, issue, on page 120, it was stated that since the electric japanning ovens were installed at the Bausch and Lomb Optical Company, of Rochester, N. Y., the percentage of parts rejected because of improper baking had been reduced "to about 40 per cent of the total amount baked as compared with 50 per cent with the gas ovens formerly used for the same purpose." This statement should have read, "to about 4 per cent of the total amount baked as compared with 50 per cent with the gas ovens, etc."

ASSOCIATIONS and SOCIETIES

REPORTS OF THE CURRENT PROCEEDINGS OF THE VARIOUS ORGANIZATIONS

BRASS MANUFACTURERS

Headquarters, City Hall Square Bldg., Chicago, Ill.

The recent Spring Meeting of the National Association of Brass Manufacturers held at the Sherman House, proved a very great success from every point of view. The reports indicate that the new Credit Exchange Bureau established by the association bore every evidence of satisfaction. The suggestion was made and favorably acted on to the effect that the commissioner might in cases of new jobbing concerns or those whose standing was of such a nature that the commissioner in his judgment might ask such concerns for a statement of their affairs, such as they furnish to the Mercantile Agencies, the idea being that to furnish or not to furnish it when requested would be entirely voluntary or optional on the part of the concern in question; with the further thought that the more frank and general the information would be that they would supply the commissioner would operate to their advantage and put him in a position to assist them when inquiries were made.

A most interesting stereopticon lecture and moving picture address on the matter of Simplified Practice, Standardization and Elimination was given during the afternoon session by W. A. Durgin from Secretary of Commerce Hoover's office at Washington. The association is deeply interested in the matter of Standardization and Elimination and this came at an opportune time. The association authorized Messrs. Wasweyler and Webster to appoint a catalogue committee with a view of getting out a new official catalogue in 1925 which is in keeping with the understanding with the various jobbing organizations.

The convention authorized an appropriation of $500 on recommendation of Mr. Mueller, of the Water Works Division of the Standardization Committee, for the purpose of having corrosion tests made by the Bureau of Standards.

The Committee on Government Specifications of which Mr. Mueller is chairman made a very interesting report and will soon complete their work and report to the United States Government in Washington with whom they are working.

The following members were accepted to membership and several other prominent concerns advised by the next meeting they would file their application for membership: Acme Brass Works, Detroit, Mich.; Hoelscher Brothers, Chicago, Ill.; Capitol Brass Works, Detroit, Mich.; McRae & Roberts Company, Detroit, Mich.

The commissioner was instructed to order uniform models and gauges from the Greenfield Tap & Die Company, the idea being to get gauges that will give the proper thread and taper of faucets for lavatory purposes that would be of a standard uniform size.

The financial as well as the numerical strength of the association was reviewed on reports tendered by the commissioner which indicated the association was never in sounder financial condition and stronger from the point of membership than at the present time.

AMERICAN ELECTRO-PLATERS SOCIETY

NEWARK BRANCH

Headquarters, Care of O. F. Carlson, 225 W. Grand Street, Rahway, N. J.

The Newark Branch, American Electroplaters Society, is now making preparations for the Fifth Annal Banquet, to be held at Achtel-Stetter's banquet halls, 842 Broad Street, Newark, N. J., on Saturday evening, April 21, 1923.

An afternoon session will be held from 3:30 to 7 o'clock on the afternoon of the banquet, for which an attractive educational program is being arranged.

An effort will be made to bring together factory managers, representatives of supply houses and foremen platers at the afternoon session for the purpose of closer co-operation.

There will be an exhibition of work being done by every member of the Newark Branch, and space will be provided for the exhibition of supplies used in the various processes of metal finishing. O. F. Carlson is the Secretary of the Banquet Committee, which consists of Horace H. Smith, Chairman, Ed. W. T. Faint, Chas. G. Piske, Geo. W. Onksen, Roy Stout, Royal F. Clark and O. J. Sizelove.

A tentative program for the educational forum follows: 1, address of welcome, Oliver J. Sizelove, president; 2, address by chairman, Walter L. Mitchell, Supt. Tiffany Co.; 3, address, Throwing Power in Electro-plating, Dr. W. Blum, Bureau of Standards; 4, address, selected, Dr. Hiram S. Lukens, University of Pennsylvania; 5, address, selected, Dr. H. B. North; 6, address, selected, George B. Hogaboom; 7, address, selected, L. H. Graham; 8, Paper Platinum Assay, F. S. Ray; 9, From the Buyers' Viewpoint, E. F. Kopp; 10, Bright Nickel Plating, Charles H. Proctor, Founder A. E. S.; 11, Master Electro-Platers, Edward W. T. Faint; 12, Rapid Nickel Plating, Royal F. Clark; 13, Selected, Horace H. Smith; 14, Black Nickel, John DeMars; 15, Gold Plating, George Reuter; 16, Nickel Plating on Aluminum, DeWitt Moore.

NEW YORK BRANCH

Headquarters Care of J. E. Sterling, 468 Grand Ave., Long Island City, New York

On March 23 the New York Branch held a meeting to decide whether to endeavor to obtain the Supreme Convention for 1924. Most of the members present felt that it was not advisable.

PROVIDENCE-ATTLEBORO BRANCH

Headquarters, Care of C. J. Poyton, Ohio Avenue, Providence, R. I.

It is the aim of the Convention Committee of the Providence-Attleboro Branch, in charge of the coming National Convention, to make it one of the biggest and best ever held by the A. E. S. By this they mean best in attendance, quality of technical papers and entertainment. George B. Hozsboom and John E. Garrick have been appointed the committee on papers, and the members are sure this branch will be well taken care of.

A big feature of the entertainment will be an all-day trip to Newport, and shore dinner, on Tuesday, July 2, 1923. It is planned that, instead of having the usual baseball game between the East and the West, water sports be held. According to the Providence-Attleboro Branch, it looks as if the West will have to take the count this year.

AMERICAN ELECTROCHEMICAL SOCIETY

Columbia University, New York City

The Spring Meeting of the American Electrochemical Society will be held in New York City, Thursday, May 3rd, to Saturday, May 5th, inclusive. Among the Papers which have previously been distributed to the members at large are as follows:

The Preparation of Platinum and Platinum Rhodium Alloy for Thermocouples—Robert P. Neville, Bureau of Standards.

The Effect of Iron in the Electrodeposition of Nickel—M. R. Thompson, Bureau of Standards.

The Preparation of Fused Zirconium—Hugh S. Cooper, Kemet Labs. Co., Inc., Cleveland, Ohio.

Investigation of Platinum Metals at the Bureau of Standards—Edward Wichers and Louis Jordan, Bureau of Standards.

Chromizing—F. C. Kelley, General Electric Co.

QUAD CITY FOUNDRYMEN'S ASSOCIATION

Headquarters, Moline, Ill.

The nominating committee recommended the following slate to be voted on at the annual meeting in April: President, A. E. Hageboeck, Frank Foundries Corporation, Moline, Ill; vice-president, John Ploehn, French & Hecht, Davenport, Iowa; secretary and treasurer, H. C. Cooper, John Deere Harvester Works, East Moline, Illinois. Directors: Bettendorf, A. K. Reading, Zimmerman Steel Co.; Davenport, H. Soverhill, Davenport Locomotive Works; Rock Island, Leon Mitchell, Rock Island Stove Co.; Moline, Mart. Carlson, Barnard & Leas; East Moline, P. T. Bancroft, John Deere Harvester Works.

WASTE MATERIAL DEALERS

Headquarters, Times Square Bldg., New York.

The tenth annual meeting of the National Association of Waste Material Dealers, Inc., was held at the Hotel Astor, New York, on Wednesday, March 21st, the meeting being called to order by President Overton at 11 A. M. Not for three years has there been such a large gathering at an annual meeting of the association. Not only was there a large attendance from Eastern points, but there was a good representation from the West. There seemed to be not only plenty of optimism in reference to future business conditions, but also with reference to the continued success and enlargement of the association.

After the routine business had been disposed of, President Overton submitted his annual report, which was listened to with marked attention. He paid a tribute to the incoming President, Harry R. De Groat, and assured the members that they had in Mr. De Groat a president who would give the association the best that there was in him.

The following directors were elected for two years: Frank C. Overton, Fred W. Reidenbach, Charles A. Barnes, Walter Schoenbach, George M. Graves, Isidore Cohen, Isidore Klous, Fred Mayer, M. Gintzler, A. Glant, M. B. Speer, A. J. Moran.

The following officers were elected: First vice-president, James Rosenberg; second vice-president, Egmont Frankel; third vice-president, Fred Mayer; treasurer, Chas. M. Haskins.

MEETING OF METAL DIVISION

A meeting of the Metal Division, of which Mr. Egmont Frankel is chairman, was held at the Hotel Astor on Wednesday, March 21st, immediately following the annual meeting of the association. There was a good attendance present, and after the re-election of Mr. Frankel as chairman of the division, there was an exchange of opinion between the various members present covering the classification under which auto radiators should be purchased. This is a matter which has given various members considerable trouble, apparently because of the difference of opinion which has existed in reference to the matter. The secretary was instructed to get the views of prominent consumers of such material and submit same to the classification committee for consideration and report at the next meeting.

BRITISH NON-FERROUS RESEARCH

The British Non-Ferrous Metals Research Association now has for its director, Dr. R. S. Hutton. E. A. Smith, who from the establishment of the association in 1919 was secretary, has become research metallurgist to the Sheffield Smelting Company, and in that capacity is doing important work with regard to the precious metals, a department in which he has for a long time specialized. Dr. Hutton will for the present be responsible for the secretarial work of the association. He has a strong family association with the metal trades, his grandfather having been concerned with the earlier developments of electro-plating and the production of nickel and nickel silver in Birmingham. He graduated with first-class honors in chemistry at Manchester University and for some years afterwards was engaged in research work successively under Professor Arthur Schuster (afterwards secretary of the Royal Society), Professor W. Ostwald (Leipzig), and Professor Henri Moissan (Paris). He was afterwards engaged in teaching in Manchester University and ultimately became assistant director of the Physical Laboratories. In 1908 he left Manchester to assist his brother in the reorganization and management of the family business of William Hutton & Son, manufacturing silversmiths and cutlers of Sheffield, Birmingham and London. As managing director and secretary of the Sheffield Flatware Company, an offshoot of the Hutton firm, formed to exploit a new process for the manufacture of spoons and forks, Dr. Hutton assisted in the development of a considerable business, the works being now one of the largest of its kind in the country and having a very wide export trade. He has continued his interest in scientific work and has served on the councils of the Faraday Society and the Institute of Metals and other important investigating bodies.—H.

Personals

Hon. **Charles F. Brooker,** for many years a leader in the brass industry in America, observed his 76th birthday on March 4th in Florida, where he is spending part of the winter. He is chairman of the board of directors of the American Brass Company. Mr. Brooker's Waterbury friends, and they are legion, take a deep pride in pointing to him as one of the industrial geniuses of the United States of the past fifty years. Several items and sketches of his career have been published in THE METAL INDUSTRY.

Jonathan Bartley, well known to users of crucibles and graphite, has severed his connection with George F. Pettinos and taken up the management of the new importing office of the Asbury Graphite Mills, at 50 Church street, New York.

Clive C. Small, graduate of the University of Maine with a degree of chemical engineer, who during the past three years has done considerable research on electrolysis has become connected with the John J. Vay Company, Cleveland, Ohio. In the future Mr. Small will be in charge of the chemical end of this firm.

Charles F. Lederer has been appointed as general supervisor of rail welding, to assume entire charge of all technical work in the field, by the Metal & Thermit Corporation, 120 Broadway, New York.

Frederic B. Stevens recently wrote an article for the Detroit News, discussing the tariff.

Deaths

FRANCIS ANTON STRATER

Francis Anton Strater, who was in his 89th year died at his home, 50 Sumner road, Brookline, Mass., February 25, 1923, following a year's illness. He was a native of Boston, and his father, Herman Strater, founded the firm of Herman Strater & Son, coppersmiths, at 74 Sudbury street, Boston, of which the son was for many years a member.

C. J. SEELEY

C. J. Seeley, late superintendent of T. McAvity & Sons, Ltd., St. John, Canada, died recently at his home in St. John.

WILLIAM J. METCALF

William J. Metcalf died recently at his home in Stamford, Conn. He was 40 years old. Mr. Metcalf was assistant to the president of the Yale & Towne Manufacturing Company, having been with the corporation since 1902.

WILLIAM H. ROGERS

William H. Rogers, 68 years old, formerly at the head of the W. H. Rogers Silverware Company, Plainfield, N. J., died in Plainfield, March 1, 1923.

NEWS OF THE INDUSTRY

BUSINESS REPORTS OF THE METAL INDUSTRY CORRESPONDENTS

WATERBURY, CONN.

APRIL 2, 1923.

The coming of spring has brought with it increased prosperity to the brass industries including higher wages, and in spite of the high wages, increased activity on the part of radical agitators. Wage increases in the three largest plants, whose example is followed by most of the others, have been granted twice within the past month, and yet within the same time, Carlo Tresca, noted radical agitator, has made three unsuccessful attempts to speak in the city.

It is known that plans were in formation, prior to his visit, among some of the foreign and radical element in the city for the reestablishing of a radical labor union to include all the unskilled laborers of the brass industry in the Naugatuck valley, such as caused the unsuccessful strike of 1920. Tresca's visits were brought about by the activities of a small local branch of the Workers' party, offshoot of the Communists' party, which is attempting to reestablish this radical labor union. The prompt granting of wage increases, it is thought, may disconcert these radical leaders and prevent the formation of strike plans which were in progress.

The last wage increase is the fourth within six months, and increases amount to roughly from 30 to 40 cents an hour as the hiring rate. The third increase was granted shortly after the first of the month, first, by the **Chase Companies,** and followed the next day by the **Scovill Manufacturing Company** and **American Brass.** This increase was approximately from 35 to 37½ cents an hour. On the 29th of the month, the three big plants announced simultaneous increases, raising the hiring rate to 40 cents an hour and making corresponding increases to all those in the employ of the plants.

The two increases affect approximately 18,000 men and will mean a weekly payroll of about $50,000. No demands or requests were made on the factories by the employees for any of the increases, but the officials felt that the cost of living had increased so that a wage increase should be made.

Former **American Brass** stockholders in this city, now holders of the stock of the **Anaconda Copper Mining Company,** which owns the American Brass Co., were agreeably surprised last month to receive their first dividend, that of 75 cents a share, which is the first declared by the company since Nov. 22, 1920, when a dividend of $1 a share was declared. Speculative belief that the directors' action meant that the stock had again been put on a regular dividend basis was reflected in transactions in the stock, which moved to 51⅞, a new high price for the year. If adopted as a regular rate the 75 cent quarterly dividend would be an annual dividend of $3 a share or $1 less than the rate in effect when dividend payments were discontinued. Granting of dividend was coincident with the decision to increase the capital stock from 3,000,000 to 6,000,000 shares.

Activities of the **National Physical Laboratory** of England were described to local brass experts by **Dr. Walter Rosenhain** of England, one of the foremost metallurgists of the world, who spoke here last month under the auspices of the Production Club. **F. S. Chase** of the Chase Companies, **E. W. Goss** of Scovill Manufacturing Company, **W. H. Basett,** metallurgist of the American Brass Company, **E. S. Sanderson** and **D. L. Summey** of the Scovill Company, were instrumental in securing the speaker.

Dr. Rosenhain denied that he had ever stated that he had discovered a method for tempering copper and although he had succeeded in revealing new methods for hardening he did not expect to see anyone of this generation succeed in tempering copper. He also gave warning to the brass manufacturers to watch out for competition with steel, stating that stainless or rust-resisting steel is a product which will soon seriously compete with non-ferrous, rust resisting metals such as brass. At present the high cost of producing stainless steel, due to the expense of the metal, chromium, used in the process, prevents rust-resisting steel from seriously competing with brass, but with metallurgists working hard to devise a cheaper process of making it, it will not be long before there will be such a competition. To meet this competition the brass makers must produce alloys with greater resistance to corrosion, he said.—W. R. B.

BRIDGEPORT, CONN.

APRIL 2, 1923.

Government investigation of an alleged plot to ship arms and munitions from New York to Irish Republican rebels has shifted to Bridgeport and federal agents have been nosing about the **Remington Arms Company's** plant here in an effort to trace shipments. Officials of the Arms have offered assistance and placed their records at the disposal of the agents. No blame will be attached to the Bridgeport plant, in the event it is proven that the munitions seized in New York were purchased here, the agents state. They merely wish to get a record of the shipments which will give them a clue in running down the wholesaler in New York who resold the arms and ammunition. No law governs shipments of arms and munitions in the United States except to the Mexican border. The manufacturer's liability ceases after he has shipped the goods under rules laid down by the Interstate Commerce Commission.

That the **American & British Manufacturing** Company's plant in Crescent street, which with its machine equipment is estimated to be worth approximately a million dollars, may have to pass under the auctioneer's hammer for the $182,250 bid for it by the **Bridgeport Iron & Metal Company,** seems likely. It will be some time before a decision is finally reached in the matter due to the fact that other properties of the company in Providence are scheduled to be put on the auction block next week.

The difficulties encountered are similar to those in the sale of the **Morris Metal Products Company,** where it was decided to employ sales specialists. Over 7,500 catalogs were sent out to all parts of the world advising every dealer in brass machinery, and yet but two bids were received. This experience decided the judge that in the future interests of the creditors would be better served by having the court auctioneer handle the sales instead of specialists.

Local brass goods makers are now turning their activity to the production of radio receiving sets and apparatus. The **American Specialty Company** has developed a complete line of receiving sets and units and parts for which it is now finding a good market. The **Bilton Machine Tool Company** is to make radio set head telephones, while the **Monumental Bronze Company** is producing a cast aluminum loud speaking amplifier horn for radio apparatus.

The U. S. Employment Service says of Bridgeport, "practically all plants are operating full time, with factories that manufacture electrical appliances on all overtime basis. Steady increase in the number of persons employed and in total number of hours worked. Marked shortage of female workers, heavy bodied laborers and skilled help, especially molders. No housing problem." The service states industrial activity and general business prosperity throughout the state has entirely recovered from the slump of 18 months ago.—W. R. B.

TORRINGTON, CONN.

APRIL 2, 1923.

A prominent manufacturer expressed the opinion to a METAL INDUSTRY correspondent that if adequate transportation facilities were available, the Torrington plants could employ at least 300 more men. But then, on the other hand, if the transportation problem were to be solved, there would be some question whether 300 or even 100 additional workers could be secured. There is already enough work for every-

body and in some departments a shortage of labor is being manifested.

Unskilled workers in practically all the Torrington shops were recently given an increase of five cents per hour, bringing the hourly wage basis from 35 to 40 cents. Skilled and semi-skilled workers have also in a number of instances been granted advances in pay. Several of the shops are working over-time.

Charles F. Brooker, chairman of the board of directors of the American Brass company, observed his 76th birthday on March 4 in Florida, where he spent part of the winter.

The **Winsted Hardware Manufacturing Company,** one of Winsted's growing metal industry concerns, has awarded the contract for the erection of a one-story factory building of mill construction, 146 feet by 44 feet. The new building will stand north of the present factory on Lake street, Winsted.

Plans have been completed by Architect William Hunt for a three-story addition to the plant of the **Union Hardware Company.** Bids will be asked immediately and if the prices are satisfactory it is expected that construction work will be undertaken this spring. The new building will stand north of the office building, fronting on Migeon avenue.—J. H. T.

NEW BRITAIN, CONN.

April 2, 1923.

Without a sign of any labor trouble and with the greatest problem one of securing sufficient labor to insure capacity production, practically every New Britain Manufacturer faces the spring and summer optimistically. There is not a concern that has not plenty of orders to keep all departments doing at capacity and may departments are working extra hours and in some instances night shifts to keep abreast of orders. At the **P. & F. Corbin** branch of the **American Hardware Corporation** production is the big problem, this year giving promise of being one of the biggest in the history of the concern. About the same conditions exist at the other branches of the corporation. The **North & Judd Manufacturing Company,** makers of buckets, harness trappings and novelties, were never busier and at the **Landers, Frary & Clark** plant the same thing holds true as it does at the **Stanley Works** where business in both the hot and cold rolled steel and the wrought steel butts is flourishing.

Perhaps the outstanding item as far as local conditions are concerned is the statement presented at the annual meeting of the **New Britain Machine Company** yesterday. This concern, which has not paid dividends even on the preferred stock for several years and which, when reorganized several months ago was virtually "on the rocks" gives every indication of coming back strong. Favorable progress has been made in prosecution of claims of $469,803 against the Government on war time contracts and unfilled orders are greater than at any time since September, 1920. Especially significant is the item which shows that notes payable have been reduced from $1,100,000 to $725,000.—H. R. J.

ROCHESTER, N. Y.

April 2, 1923.

There has been very little or no change in the business situation in Rochester, so far as the employment of non-ferrous metals is concerned, during the month that is ending. In every manufacturing plant about town, as well as the electro-plating works and brass foundries great activity prevails.

Inquiry today revealed the fact that employment in the non-ferrous metal departments of the various industries of the city was never so large and indications are to the effect that a continuation of prosperous times throughout the year seems quite probable. Demand is somewhat in excess of supply at this time, but with the arrival of the warmer period all activities are bound to slow down and give delayed departments an opportunity to catch up.

According to the **Community Conference Board** it is possible that building activities will not be as large this year as in 1922, but estimates at this time place the total in sight as valued at $13,478,992. This will entail a large expenditure for finished copper, brass, zinc, tin and nickel materials, in addition to the large employment of lead, antimony, bronze and aluminum.

Gordon W. Wolfe is a new director chosen at the recent annual meeting of the **Todd Protectograph Company, Inc.** Mr. Wolfe is superintendent of the big University avenue plant and has been connected with the company in an executive capacity for ten years.

Henry S. Putnam, former superintendent and general manager of the **American Can Company,** was in Geneva one day recently and delighted the business men of that little city with the announcement that the company contemplated reopening its plant in Geneva. The War Department took over the can company's plant during the World War and employed 1,000 men and women. Since the Government gave up the plant it has remained idle. Mr. Putnam told the Geneva business men that the equipment of a plant in Newark, N. J., would presently be transferred to the Geneva plant and industry in the latter city resumed.—G. B. E.

DETROIT, MICH.

April 2, 1923.

Manufacturers in all lines of brass, copper and aluminum report a continual increase in business, due it is believed to the general revival of conditions throughout the United States. Producers of plumbing supplies, particularly find buying on the increase, with a future outlook far above that of any previous season for many years. The same is reported of jewelry manufacturers. This latter, of course, is due to the general improvement in business of all lines.

Manufacturers at present are experiencing considerable difficulty from transportation troubles. Every railroad entering the city has established embargoes, and in order to obtain prompt shipments permits must be obtained from railroads guaranteeing that cars will be promptly unloaded. Fifteen thousand loaded freight cars are reported standing in the various Detroit yards, many of them for a considerable time.

A great many concerns here are forced to buy vast quantities of raw materials, and partially completed brass and aluminum parts in surrounding places. Owing to this embargo more or less difficulty is experienced. It is hard to tell how long this may continue, as the entire trouble is due to heavy manufacturing and buying from this point.

It is hardly necessary to discuss the automobile business at this time. It is passing through one of the most wonderful periods of prosperity in its history. There seems to be no end in sight as many concerns have orders booked for months ahead.

At a recent annual meeting of the **Michigan Smelting and Refining Company,** Charles B. Bohn was elected a director, succeeding Frederick G. Seagrave, New York, retired. Other directors elected are John R. Searles, Norman H. Sillman, Henry Levitt, Emory W. Clark, Leo Butzel and Charles O. Patch.

The officers are president, John R. Searles; vice-president, Norman H. Sillman; treasurer, Frederick H. Bahr; secretary, Henry Levitt.—F. J. H.

CLEVELAND, O.

April 2, 1923.

Sale at public auction of the gigantic plant and modern equipment of the **Cleveland Brass & Copper Mills,** located at Cleveland, O., was ordered March 20 by Judge D. C. Westenhaver, of U. S. district court for Northern Ohio, to satisfy government claims for $514,588.91. Claims are based upon a loan of $450,000 and accrued interest made by the government to the company to finance the purchase of material and equipment with which to fulfill war contracts. Judge Westenhaver ordered that the sale be consummated within thirty days. United States Marshall George A. Stauffer, who will conduct the sale, stated that the plant, machinery and three parcels of land were mortgaged by the company to secure the loan,

which constitutes a first lien. Six promissory notes are held by the government, and the company's failure to pay them placed the firm in default.

The plant is considered one of the most modern and best equipped brass shops in the Central states, and was built for the production of sheet and rod stock. More than 10 acres of land are included in the company's holdings.

Stockholders forced the company into receivership in December, 1922, **Charles Anderson,** president of Anderson & Company, industrial engineers and managers, being named receiver by the court. The property has been closed since the late fall of 1921.

Several weeks ago stockholders petitioned Anderson to make an investigation of the company's financial condition, pointing out that more than $2,450,000 had been paid into the company for stock which never paid a dividend. The company, incorporated under the laws of the State of New York, was organized in 1917. Anderson declared that a syndicate of eastern capitalists and two separate individuals are looking over the property with the view of purchasing. The Fidelity & Deposit Company of Maryland, as surety, and the Cleveland Storage Company, Clarenden Refining Company, and one Angelo Pinto are named as party defendants of the brass company.—R. W. P.

CHICAGO, ILL.

APRIL 2, 1923.

The metal industry in Chicago territory is not complaining because of lack of orders. Most of the factories here have more orders than they can fill, with their present capacity. What they do complain of is the fact that prices on raw materials are soaring, and that skilled labor in some highly specialized classes of work is at a premium.

President Kelly of the **Kelly Brass Works** struck the keynote of the local situation in the following: "The greatest difficulty the Chicago manufacturers face is that of obtaining material. The selling market is splendid, all other conditions are normal, and yet we are constantly confronted by this important problem. It has gone to the point where the material houses are refusing to allow their salesmen to promise delivery and are requiring them to refer such matters direct to their home offices. One of the largest Chicago houses from whom we buy material has refused absolutely to promise delivery on tubing and sheet material."

The Russakov Can Company said: "There is no scarcity of orders. In fact, orders are coming in more plentifully than they have since the prosperous years of 1917 and 1918. We have been obliged to rent temporary space near our present factory in order to fill our contracts."

The **R. B. Hayward Company** is moving on May 1st into its own building at 1714 Sheffield avenue, which is nearing completion and which will double its present capacity.

The **Nagel-Chase Manufacturing Company,** formerly manufacturers of lamps for export trade, have branched into the business of metal specialties. Not only do they perfect the crude ideas of inventors, but they help market the finished product. **Edward Schultz,** who recently became treasurer of the company, was formerly the general superintendent of the **American Can Company's** shop department here.

William A. Durgin, of the United States Department of Commerce, was the principal speaker at the Spring meeting of the **National Association of Brass Manufacturers,** which was held in the Hotel Sherman in Chicago last Friday. His subject was "Simplification Practice and Standardization Work." —J. C. S.

BOSTON, MASS.

APRIL 2, 1923.

Conditions in the metal trades continue to improve. Inquiry among foundrymen indicates a gradually increasing volume of orders with the demand for castings from some quarters especially brisk.

Metal manufacturing lines dependent upon building operations are passing through the usual slack period but are anticipating greater activity in April. There is little possibility that the enormous building program planned for this section will be interrupted by labor troubles. A compromise agreement has been made whereby 30,000 building trades mechanics will be increased from $1.00 to $1.05 an hour on April 1 provided it is ratified by the unions involved.

Duro Pump Company, of Boston, motors, pumps, and other machinery and appliances has been incorporated with a capital of $15,000 by Fred W. Goldthwait, James F. Kellogg and Joseph E. Perry.

Master Sales Company, Inc., of Worcester has been incorporated to handle metals and by-products with $100,000 capital. Dorothy C. Woodbury, Charles H. Harris, Howard W. Cowee and Joseph F. Bertsch are the incorporators.

General Products Corporation, of Boston, has been incorporated with $100,000 capital to handle electrical supplies by Milton C. Rogers, Fred W. Barkley and John W. Damon.

Federal Automatic Sprinkler Company, of Boston, has been incorporated with a capital of $20,000 to deal in automatic sprinklers. The incorporators are James P. Griffin, William I. Schell and Jacob Leitherstein, all of Boston.

Chandler Company, Springfield, metal goods, has been incorporated with $60,000 capital by Louis J. Chandler, Arthur F. Basset and Gertrude M. Ward, all of Springfield.—C. W. R.

TRENTON, N. J.

APRIL 2, 1923.

Judge William N. Runyon in the United States District Court at Trenton, N. J., appointed Arthur T. Vanderbilt, of East Orange, and B. E. F. Rhodine, of Caldwell, as receivers for the **Magna Metal Corporation,** a $12,500,000 concern with a plant at East Newark. The appointment of the receivers followed the complaint of Benjamin F. Robinson, of Newark, vice-president of the company, who declared that the concern was unable to continue unless it raised considerable cash.

The company was incorporated at Trenton some time ago with 2,500,000 shares of first preferred stock and the same amount of second preferred stock and 7,500,000 common stock. Ninety thousand shares have been issued and are outstanding. Robinson holds 800 shares of stock in the concern. Fifty thousand pounds of metal have been placed in the company's storage at East Newark as part of the asset to look after notes. Mr. Robinson says the company is unable to continue without ready cash and that the company can be profitably operated with a certain amount of money. The company has plenty of orders on hand and has expended considerable money to develop its process.

John Enequest is president of the company; B. E. F. Rhodine, vice-president, and Raymond S. Willets, secretary and treasurer. The concern has assets of $247,000 and $140,000 liabilities.

Edgar Palmer, of New York City, and Rye, N. Y., president of the **New Jersey Zinc Company,** has purchased the Garrett mansion at Princeton, N. J., measuring 267 by 539 feet. The cost was $150,000. Mr. Palmer, who is a graduate of Princeton University, has been living the past winter at "Westland," the former home of Ex-President Grover Cleveland, on Bayard Lane, Princeton. Mr. Palmer will spend the winters at Princeton.

Under a general upward revision of the labor rate, the **John A. Roebling's Sons Company** has granted an increase in wages to its workmen amounting to five cents an hour. The pay scale was boosted from 34 cents to 39 cents an hour. Upwards of 7,500 workmen in the Trenton and Roebling, N. J., plants are benefited by the new rate. The voluntary increase in wages follows closely upon the institution of a plan by the Roebling company which extends free life insurance for every person who has been in its employ for one year.

The **John A. Roebling's Sons Company** and the individual members of the big concern contributed liberally for the new hospital for crippled children and the new home for the Y. W. C. A. Ferdinand W. Roebling gave $14,500 to the hospital. The **Jordan L. Mott Company** contributed $10,000 to the Young Women's home, Colonel Washington A. Roebling, $10,000; Edmund Roebling, $25,000; Siegfried Roebling, $10,000; Westinghouse Lamp Company, $10,000.

The plant of the **Artistic Metal Products Corporation,** 91 New Jersey Railroad avenue, Newark, was recently badly damaged by flames.

Copper **Products Corporation,** of Elizabeth, N. J., has been incorporated at Trenton with $200,000 to manufacture copper radiators.

Newark **Metal Manufacturing Company,** of Newark, has been incorporated at Trenton by Louis R. Press with $10,000 capital to manufacture metal goods.

Essex **Novelty Company,** of Newark, N. J., has been incorporated at Trenton with $25,000 capital to make jewelry, etc. Herbert L. Halley, of Irvington, and Samuel J. de Martine and Thomas H. Clarke, of Newark, are the incorporators.

The plant of the **Phillipsburg Graphite Company,** Bloomsbury, N. J., recently destroyed by flames with a loss of $50,000 will be rebuilt.

An estate valued at $250,000 is disposed of in the will of Mrs. Lizette Zurbrugg, widow of Theophilus J. Zurbrugg, founder of the **Keystone Watch Case Company,** Riverside, N. J. Zurbrugg left an estate value at $1,000,000, part of which went for the erection of a hospital at Riverside.

Suit has been instituted in the Court of Chancery by Adrian Vermeule, of New Brunswick, and the Thorne Roller Skate Corporation against the **American Non-Ferrous Metals Corporation** of Elizabeth, N. J., to determine upon an equitable distribution of the stock of the latter corporation. The complainants charge that they are threatened with being ousted from the company. The trouble also involves a patent.

The equipment and materials of the **Riley-Klotz Manufacturing Company,** 17-19 Mulberry street, Newark, were recently sold at auction by the receivers. The company had been engaged in the metal specialties business in Newark for many years. The company occupied a six-story building. The company's real estate is valued at $71,000.—C. A. L.

INDIANAPOLIS, IND.

April 2, 1923.

Operations are being started by the **Universal Brass Works** of Indiana, 139 South East street, Indianapolis, a new industry. Most of the machinery is in position. The new company will manufacture turret nozzles for fire fighting equipment; hydraulic mining equipment and Von Duprin panic devices and other products. C. H. Meyer is president of the company; Mrs. L. A. Meyer, vice-president, and E. S. Harter, secretary-treasurer.

The Victory Bearings Company, Indianapolis, has been bought by the McQuay-Norris Manufacturing Company of St. Louis, Mo. Articles of incorporation show a capitalization of $150,000. The output of the plant will be enlarged. R. F. Crom, Indianapolis, who will be manager of the new company, also is secretary. This company a year ago bought the property of the **Wainwright Engineering Corporation,** of Connersville, and H. A. Wainwright, general manager of that plant, is one of the incorporators of the re-organized Indianapolis company.

The Adams Plating Company, 138 West Tenth street, Indianapolis, is constructing a small addition to its plant.

The Northern Indiana Brass Foundry Company, Elkhart, Ind., has changed its name to the **Northern Indiana Brass Company.**

The new plant of the **Acme Works, Inc.,** Indianapolis, is reported operating full capacity. Approximately 10,000 pounds of brass castings, an equal number of pounds of aluminum castings and a quantity of bronze castings are being turned out daily. The new building, which embodies both the foundry and pattern shop, was completed recently.

G. M. **Leslie,** treasurer of the **Brass Foundry & Machine Company** and the **Fort Wayne Foundry and Machine Company,** both of Fort Wayne, Ind., has been elected president of the two companies to succeed the late John H. Bass, founder and president of the Bass company. Mr. Bass died December 17, 1922, but for some time prior to his death had been active in the affairs of his company. **C. T. Strawbridge** will continue as vice-president and **L. Heely Link** as secretary of the Bass company.

The Sterlite Foundry and Manufacturing Company has been organized at Auburn, Ind., with a capital stock of $275,000. The directors of the company are J. A. Rendel, R. J. Schweitzer, G. C. Emmerick, M. S. Liechty, Charles W. Ruchel, A. L. Kuhlman and Raymond Stiteler.

The Northern Indiana Brass Company at Elkhart, Ind., has increased its capital stock from $10,000 to $100,000.

Six men who have given from sixteen to twenty years of service each to the industrial enterprises headed by **J. W. Johnson,** of Kokomo, Ind., have been promoted to important positions. Four of the men began work for Mr. Johnson when they were lads in knee trousers and all have worked up from the ranks.

William Cunningham, who will have been associated with the industries twenty years next September, has been made special assistant to Mr. Johnson in the supervision of four plants, the **Kokomo Brass Works,** the **Ford & Donnelly Foundry,** the Hoosier Iron Works and the Kokomo Malleable Iron Works. **Paul Burke** has been made general sales manager of the **Byrne-Kingston Company. Mark Falvey,** formerly branch manager at Chicago, has been made general sales manager of the **Kokomo Brass Works. Paul Johnson** has been promoted to director of purchases for the Kokomo Brass Works; **Karl Krebser** has been advanced to general factory manager of the Brass works and **Mark Grace** has been made general sales manager of the **Kokomo Electric Company.** According to Mr. Johnson all of the enterprises are busy and night shifts are to be put on in the near future.—E. B.

MONTREAL, CANADA

April 2, 1923.

This month so far shows a general strengthening in the demand for brass goods of every description and inquiries are more frequent and of a more stable character. The Canadian motor car industry is showing considerable expansion, which will result in still greater buying.

Jenkins Brothers, Ltd., valve manufacturers, are running their plant to full capacity since January 1, and the indications point to the largest volume of business this year, as their domestic and foreign orders are very heavy.—P. W. B.

BIRMINGHAM, ENGLAND

March 19, 1923.

Conditions in the non-ferrous industries continue to improve, particularly in the brass foundries. Export business is still mainly with Australia and other parts of the British Empire. Trade with India is but slowly improving. The Scandinavian countries are now the chief Continental markets for British hardware products though a slowly improving business is being done with Holland. Aluminum founders are getting an increasing amount of work for the motor-car industry whilst aluminum hollow-ware business is looking up, the home trade having benefited by the check on German imports resulting from the 33⅓ per cent duty imposed under the Safeguarding of Industries Act. Broadcasting schemes have caused a boom in wireless telephony and this has made wire drawers and manufacturers of the various apparatus parts busy.

The electro-plate trade has had a dull time since Christmas, but is now beginning to do better, especially in the cheaper lines. In the jewelry trade there has been but a slight improvement.

Prices of metals continue to rise and demand is increasing. Holders of scrap metal are in a strong position. What remains of old cartridge metal is in a few hands and is being firmly held. Prices of all scrap are such that users are resorting more and more to new metal. Dearness and shortage of fuel, arising out of the Continental raid on British supplies following the French occupation of the Ruhr valley, are holding back the production of pig-iron and are to some extent affecting all the metal industries.

The Birmingham Section of the British Industries Fair is again being held in the Castle Bromwich Aerodrome. The number of exhibitors is about the same as last year but less

space is occupied, the minimum size of the stands having been reduced to stimulate the interest of manufacturers, which, under discouraging trade conditions has been somewhat lagging. The combined illustrative exhibit of the copper, brass, nickel and other metal rolling and tube manufacturers has not been staged this year, but there is a full representation of manufactured goods in every department and a good engineering section.—G.

Business Items—Verified.

The Chicago district sales office of the **Bridgeport Brass Company** has been moved from the State Lake Building to the Wrigley Building.

Scovill Manufacturing Company, Waterbury, Conn., announces that they are not contemplating any building operations this spring, as reported.

Fuerst Brothers Import and Export Company, Inc., formerly of 2-4 Stone street, will be located at 15 Moore street, New York, N. Y., on and after May 1, 1923.

The Pittsburgh Branch of the **Metal & Thermit Corporation** on May 1st will be moved from 801-807 Hillsboro street, Corliss Station, to 1514 Fayette street, N. S.

The Rome Brass & Copper Company, Rome, N. Y., announces that their plans have been changed and that they are not going to build in Chicago, as reported.

The Waterbury Farrel Foundry & Machine Company, Waterbury, Conn., is adding two stories to one of their buildings, which will give them additional storage space.

The Ohio Galvanizing Company, Niles, Ohio, has placed contract with the Warren Engineering Company for an addition, 76 x 120 ft. It manufactures various products of galvanized sheets.

The Monarch Metal Company, Main Street West, Hamilton, Ont., Can., has let general contract to S. J. White, 165 Main Street East, to put a new roof on the building which was damaged by fire.

The Shepard Art Metal Company, Detroit, Mich., a subsidiary of the Fisher Body Corporation, has started construction of a new plant on Junction avenue, which will again double their capacity.

The Frictionless Metal Company has moved its main office and plant from Chattanooga, Tenn., to 1458-1460 Collins street, St. Louis, Mo., where they will engage in the manufacture of bearing metals on a much larger scale.

Charter Gas Engine Company, Sterling, Ill., announces the purchase of the oil engine business of the August Mietz Corporation of New York City, manufacturers of the "Mietz and Weiss" and "Mietz" Semi-Diesel oil engine.

On and after April 1st all communications to the general offices of the **Standard Underground Cable Company,** should be directed to 100-108 Seventeenth street, Pittsburgh, Pa., instead of to the Westinghouse Building as heretofore.

The Atwater Manufacturing Company, hardware, tools, etc., Southington, Conn., has increased its capital stock from $150,000 to $500,000. This concern operates the following departments: Tool room, grinding room, drop forging, polishing.

The Marf Machine & Die Casting Company, Brooklyn, N. Y., manufacturers of die casting in aluminum, zinc, tin and lead alloys, announce the opening of their New England Office, 51 Harrison avenue, room 222, Springfield, Mass., with J. C. Bennett as manager.

The Link-Belt Company, of Philadelphia, Chicago and Indianapolis, announces that the price of their Portable Belt Conveyor, the "Cub" has been slashed 14 per cent. This machine formerly sold for $700. The new price is $585 complete with 2 horse-power electric motor.

The Tifflin Art Metal Company, Tifflin, Ohio, has placed contract for the erection of a new factory which will increase its capacity approximately 100 per cent. They are in the market for sheet metal machinery. This concern operates the following department: Stamping.

Richards & Geier, Patent and Trade Mark Attorneys, 277 Broadway, New York, announce the following additions to their staff: I. Joseph Farley, Henry Ruhl, trade-mark specialist, has assumed charge of their Trade Mark Department, and Fritz Ziegler, Jr., attorney and counsellor-at-law.

The Black & Decker Manufacturing Company, Towson, Maryland, manufacturers of Portable Electric Tools, announces that the regular quarterly dividend has been declared on preferred stock, and that the payment of dividends on common stock has been resumed, same having been discontinued for about a year, following the recent depression.

The Stern Manufacturing Company, 72 Tichenor street, Newark, N. J., manufacturing jewelers, is in the market for a speed lathe, medium sized with all equipment, and a second-hand No. 17 American Furnace Company hardening furnace foot press, Chapman or Ruesch make. This firm operates the following departments: Tool room, plating, rolling mill, stamping, soldering, polishing.

The Aluminum Pigment and Products Company, Lehighton, Pa., recently organized, has awarded contract to Charles Fenstermacher, Lehighton, for the erection of a new plant near Bowmanstown, Pa. A portion of the machinery installation will be furnished by the Fuller-Lehigh Company, Fullerton, Pa., and orders for other equipment will soon be placed. The plant will cost about $30,000.

A two-story brick addition, 50 x 100 ft., will be erected at the plant of the **Dallas Brass Manufacturing Company,** 4015 Main street, Dallas, Tex., to be used for the manufacture of brass and other metal goods, estimated to cost $35,000. J. W. Davis is general manager. This concern operates the following departments: Brass, bronze and aluminum foundry, brass machine shop, plating and polishing.

The Am-plus Storage Battery Company has established a new plant at 429-433 West Superior street, Chicago, Ill., fire having destroyed the old plant on January 24 of this year. The new plant, beside having double the floor space of the old one, is newly equipped with up-to-the-minute machinery. Provisions have been made for expansion on a much larger scale, because the demand for Am-plus batteries is rapidly increasing.

The Metal & Thermit Corporation, New York, in conducting some recent extensive experiments with different types of burners to be used in connection with its standard Thermit preheaters found that the best results were secured with a burner pipe ⅜ in. diameter, swaged down at one end and then drilled with a 5/16 in. hole. Such a burner pipe fully atomizes the fuel before it enters the mold and gives the best combustion.

The Asbury Graphite Mills, Asbury, N. J., have opened an importing office in the Hudson Terminal Building, 50 Church street, New York, under the management of **Jonathan Bartley.** Special attention will be given to orders for crude Ceylon, Madagascar and Korean Graphite. **H. M. Riddle, Sr.,** president of the Asbury Graphite Mills, is now in Ceylon, where he has made connections with some of the most modern graphite mines on the island.

Wilfred S. McKeon, of **Sulphur Products Company,** Greensburg, Pa., has given out a statement that "Liquid-Sulphur," which is known to many as an oxidizing agent, is now to be distributed exclusively in England by the **A. A. Chemical Co.,** of 1, Kinglake street, Walworth S. E. 17, London, England. Sulphur Products Company is co-operating with the Department of Commerce of the United States to further the international export of this product.

At the annual stockholders' meeting of the **Taunton-New Bedford Copper Company,** which was held in Taunton, Mass., the following officers and directors were re-elected for the ensuing year: Henry F. Bassett, agent; John H. Barrows, treasurer; Francis J. Bassett, secretary, and directors Henry F. Bassett, W. C. Baylies, William C. Davenport, N. Newbury, Frank A. Mosher, James E. Stanton, Jr., Edward H. R. Revere and William F. Thomas, Jr.

The Buckeye Soda Products Company, 22 West Second street, Cincinnati, Ohio, has acquired the chemical department of the Thos. Buchanan Company and has also secured the building at 22 West Second street. As the Thos. Buchanan

Company's interests in spot and future contracts have been turned over to them, they would appreciate having all future correspondence pertaining to these chemicals addressed to the Buckeye Soda Products Company.

The **Kirk & Blum Manufacturing Company**, Cincinnati, Ohio, sheet metal contractor and manufacturer of sheet metal specialties, has been incorporated with a capitalization of $250,000. The company does not contemplate any extensions at present, the incorporation being made for the purpose of taking into the firm a number of employees who have been connected with it for many years. This concern operates the following departments: Spinning, japanning, stamping and soldering.

The **American Brass Company** is putting up an addition to the three-story building, 67 Jewelry street, Waterbury, Conn., for the use of a subsidiary company, the **American Metal Hose Company.** Contract for this work has been let and work on this addition, which will cost in the neighborhood of $125,000, is now under way. This addition is being made to the plant now occupied by the American Metal Hose Company and will give them increased space for general manufacturing purposes.

Among the $12,000,000 worth of declared exports from Christiana, Norway, to the United States in 1922, as reported to the **Commerce Department** by **Vive-Consul H. E. Carlson,** appear 8,645,076 pounds of crude aluminum, valued at $1,442,313. Other important metal exports from this port to the United States included 436,766 pounds of zinc, of a value of $30,628. No exports to the United States of platinum are reported for 1922. In 1921 we received 44 ounces of platinum from Christiana, valued at $2,653.

On March 22nd the **Navy Department** at Washington received bids on approximately 6,100,000 pounds of copper. On the 5,000,000 pounds in ingot form located at Norfolk Navy Yard, **M. Marvin of Marvin & Company, Ltd., of America,** New York, were the successful bidders with the tender of 17.026c. a pound, while on the 1,100,000 pounds in the form of billets, located at the New York Navy Yard, the best bid was submitted by the **Bridgeport Iron & Metal Company,** Bridgeport, Conn., whose tender was 17.0396c. per pound.

The **Globe Sherardizing Company,** Cleveland, Ohio, has taken over the Globe Plating Works, combining the plating and electro-galvanizing with the sherardizing equipment, and will shortly move to a two-story building at 1259 West 78th street. Both the sherardizing and plating works were formerly a part of the Globe Machine & Stamping Company, but a year ago the latter company decided to concentrate on stamping, and separate companies were formed for sherardizing and plating. This concern operates the following departments: Galvanizing, plating, polishing and lacquering.

Carl Mayer, Secretary of the **New York Metal Exchange,** announces that at a meeting of the Tin Committee, held on March 21, to consider the question of delivery dates on shipment contracts, the following ruling was rendered:

"Where sellers have declared under the optional clauses of the contract (Rule 5, pp. D-2-3) the Committee rules that the terms '30 days' and '90 days' mentioned therein shall be construed in the sense of and as meaning 'one month' and 'three months' respectively, and delivery shall be made accordingly and subject to rule No. 2 governing deliveries."

There was an attendance of 60 or 70 at the proposed auction sale of the North Brass plant of the **National Conduit & Cable Company** on March 9th. The court had placed an upset price of $100,000 on the equipment. Attending buyers agreed that this was a fair price and were ready to start bidding for the equipment at this figure but it seems that a later stipulation of the court to the receiver was that the land and the buildings and equipment were to be sold in one unit. A number of the attending buyers were anxious to bid on the equipment but they would make no bids on the land or buildings. Consequently the sale was postponed. The proposal to sell probably will be re-advertised.

Hardinge Company, 120 Broadway, New York, announces the following:

Charles F. Pettinos, Bethlehem, Pa., has ordered a 6 ft. Hardinge Ball Mill for grinding graphite.

The Ford Motor Company, Detroit, Mich., have ordered three 5-ft. Hardinge Ball Mills for grinding various abrasives.

The Standard Sanitary Mfg. Company, New Brighton, Pa., have ordered an 8-ft. Hardinge Pebble Mill for grinding dry enamel.

The Asbury Graphite Mills, Asbury, N. J., have ordered a 4½ ft. diameter by 16-in. Hardinge Ball Mill for grinding graphite.

The Western Electric Company have purchased two 3-ft. diameter by 8-in. Hardinge Ball Mills for grinding in their Hawthorne Plant at Chicago, Ill.

INCORPORATIONS

The Ohio Cutlery Manufacturing Company, Massillon, Ohio, has been incorporated with a capital stock of $50,000 to take over the present plant of the Ohio Cutlery Company. This firm operates a grinding and polishing room.

The Anderson Pattern Works, Erie, Pa., has been incorporated with $16,000 capital stock to manufacture wood and metal patterns, by F. F. Anderson, R. A. Dugan and C. H. Anderson.

Certificate of incorporation of the **Colonial Brass Works** has been filed with the city clerk. The capital stock is $50,000 and $30,000 has been paid in to start business. This firm operates the following departments: brass, bronze and aluminum foundry, brass machine shop, tool room, grinding room.

The Columbia Specialty Company, 1508 East Fayette street, Baltimore, Md., has been incorporated with capital stock of 1,000 shares, no par value, to manufacture tin boxes, cans, and tin specialties. The company has taken over an established business with factories at the above address and at 119 North Caroline street, Baltimore, and will continue as formerly. The incorporators are William B. and H. J. Ryan.

The Sterlite Foundry & Manufacturing Company, Auburn, Ind., has been incorporated with a capital of $75,000, to manufacture special metals, metal castings, etc. The incorporators are J. A. Rendel, R. J. Schweitzer and A. L. Kuhlman, all of Auburn. Their principal output is "Sterlite." This concern operates the following departments: Brass, bronze and aluminum foundry, brass machine shop, tool room, grinding room, polishing.

John J. Vay & Company, Cleveland, Ohio, have been incorporated at Columbus, Ohio, with $100,000 capital to manufacture and deal in electroplaters and polishers equipment and supplies. The papers for the above incorporation were filed by Grabien & Grabien of Cleveland.

The Chicago Japanners, Inc., 1160 West 22d street, Chicago, Ill., have been incorporated with a capital of $150,000. They will render engineering and consulting service to manufacturers of metal parts that require finishing, and will undertake to study and report on certain articles and determine for the client the finish that is best to use, whether it be plating, japanning, enameling, painting or lacquering.

BUSINESS TROUBLES

Judge L. Hand appointed Alice H. Moran receiver under $1,000 bond for **Alexander Mandrill Company, Inc.,** metal products, 300 Canal street, New York City.

The Federal Trade Commission's proceedings against the **Aluminum Company of America** on the ground of restraint of trade were in effect upheld by the Supreme Court. The Court refused to review decisions of lower courts upholding the commission.

United States District Court, Southern District of New York—**Standard Sanitary Manufacturing Company,** complainant against **W. R. Hughes Company, Inc.,** defendant. P. Wilds, having been appointed receiver of the defendant, W. R. Hughes Company, Inc., in the above entitled suit by the United States District Court for the Southern District of New York, it is ordered by said court that all creditors and parties in interest show cause before a term of this court to be held for the hearing of motions on the 29th day of March, 1923, at 10 o'clock in the forenoon, in Room 235, Post Office Building, Park Row, New York City, why the receivership in the above entitled suit should not be made

permanent and why such other or further relief should not be granted as may be just.

NATIONAL LEAD COMPANY

The annual report of the National Lead Company for 1922 shows net earnings of $4,927,548 after deducting all expenses including reserves for taxes. This compares with net earnings of $3,481,512 in 1921. After allowing for regular dividends on the preferred stocks, the profits for the common stock in 1922 were equivalent to $15.59 a share on the $20,655,400 outstanding. The profits available for the common stock in 1921 were equal to $8.50 a share. After payment of cash dividends on common and preferred stocks last year there was a surplus of $1,879,215, which added to the profit and loss account increased that item to $22,760,090.

The consolidated balance sheet on Dec. 31, 1922, showed was in inventories, $15,696,381 accounts receivable and $4,777,583 cash. Notes receivable totaled $824,614. Net current liabilities exclusive of $4,452,245 reserves for taxes, consisted of $5,096,525 accounts payable.

CHAMBER OF COMMERCE MEETING

The coming annual meeting of the Chamber of Commerce of the United States in New York, May 7th to 10th, will not only bring together the largest attendance ever had at such a meeting, but also excite among business men a degree of interest greater than that in any other business man's session held since the days of the war. This is because the discussion is to centralize about what is recognized as the most critical and important question affecting American business and American prosperity at present—the question of transportation.

The only other matter which could possibly measure up to the transportation question is the European situation which in its effect upon American business was the keynote subject of the annual meeting last year. It will not be neglected this year as it is planned to devote one session to it, making use of those officials of the National and International Chambers who will have shortly before returned from the meeting of the International Chamber, held in Rome March 19 to 26.

ROLLED ZINC IN 1922

The output of rolled zinc in the United States in 1922 gained 76 per cent over that of 1921, as shown by replies made to the United States Geological Survey by producers.

The market quotation on rolled zinc in mill lots at the rolling plants at the beginning of 1922 was 8.5 cents a pound, declining to 7.5 cents by the middle of the year and rising to 9.5 cents at the close of the year.

The large imports of sheet zinc which were a feature of the first half of 1921 were not repeated in 1922. In all, a little over 400 tons was imported in the first nine months of the year and none in October. The average declared value at the foreign mills was 7.1 cents a pound as compared with 3.7 cents a pound in 1921.

OUTPUT OF ALUMINUM INCREASES IN 1922

The value of the new aluminum produced in the United States in 1922 as reported by the producers to J. M. Hill, of the United States Geological Survey, was $13,622,000, an increase of about 25 per cent over the value in 1921. During the first half of the year domestic aluminum was quoted at 20 cents a pound for 99 per cent grade; in August the price was raised one-tenth of a cent a pound, and on the passage of the tariff act it was raised to 23 cents a pound, where it remained during the rest of the year.

Figures showing the imports for the last three months of 1922, since the passage of the new tariff law, are not yet available. The imports of aluminum in crude form, scrap, and alloys of any kind in which aluminum is the material of chief value, for the first nine months of 1922 amounted to 31,482,893 pounds, as compared with 26,177,852 pounds for the corresponding period in 1921. Articles made of aluminum valued at $1,486,177 were imported during the first nine months of 1922, as compared with articles valued at $1,635,106 imported during the corresponding period of 1921.

In 1922 the exports from the United States included 1,538,079 pounds of ingot and scrap aluminum and alloys containing aluminum, 2,808,946 pounds of plates, sheets, bars, strips and rods, and 4,548,939 pounds of manufactured articles. In 1921 the exports included 301,951 pounds of ingots, etc., 499,124 pounds of sheets, etc., and 2,307,782 pounds of manufactured articles.

THE COPPER TRADE

Exports of copper from the United States in 1922 showed a gain of 16 per cent over 1921 and were only 11 per cent below the pre-war average, says Commerce Monthly, magazine of the National Bank of Commerce in New York. The declines as compared with 1921, in the shipments to Germany, Japan and some other countries were more than offset by the gains in exports to Italy, France, the United Kingdom, Belgium and many others.

"In the pre-war years Germany took on the average of 28 per cent of the total exports, the Netherlands 24 per cent, France 17 per cent, and the United Kingdom 15 per cent. In view of the small consumption in the Netherlands, 2 million pounds in 1913, it is probable that most of the shipments to that country were transshipped to adjacent countries. Germany took 27 per cent of the exports in 1922, France 19 per cent, the United Kingdom 13 per cent and Italy 7 per cent. A striking feature in the development of the exports has been the gain in the post-war shipments to Japan, China, Sweden and Belgium.

"Of the total imports in the first part of 1922, 53 per cent were blister, 21 per cent were refined, 14 per cent were in ore, 6 per cent were old copper and clippings, and 4 per cent were in concentrates. Imports of matte constituted the other 2 per cent. Composition metal, copper chief value, amounted to only .2 of 1 per cent of the total."

METAL STOCK MARKET QUOTATIONS

	Par	Bid	Asked
Aluminum Company of America	$100	$475	$525
American Hardware Corporation	100	55	58
Anaconda Copper	50	49⅛	49¼
Bristol Brass	25	13	18
International Nickel, com.	25	15¼	15½
International Nickel, pfd.	100	75	77¾
International Silver, com.	100	50	...
International Silver, pfd.	100	107	111
National Conduit & Cable	100	1	1⅛
National Enameling & Stamping	100	69⅞	70
National Lead Company, com.	100	128	129
National Lead Company, pfd.	100	111	111¼
New Jersey Zinc	100	177	180
Rome Brass & Copper	100	115	130
Scovill Manufacturing Company, new	...	165	170
Yale & Towne Manufacturing Co., new	...	60	62

Corrected by J. K. Rice, Jr., Co., 36 Wall Street, New York.

TRADE PUBLICATIONS

National Lathes. Catalog O issued by the National Lathe Company, Cincinnati, Ohio, illustrating and describing their various lathes.

"Loose Pulley Troubles Eliminated."—A circular issued by the St. Louis Machine Tool Company, St. Louis, Mo., advising that they can cure all loose pulley troubles at moderate cost.

Magnograms.—A booklet issued by the Magnus Chemical Company, 718 Atlantic avenue, Brooklyn, N. Y. It contains pleasant aphorisms and tales, pointing to better methods and economies in manufacturing, particularly with regard to cleaning operations.

Tenth Anniversary Blue Book, 1913-1923. An attractively bound book issued by the National Association of Waste Material Dealers, Times Building, New York city. It contains a brief history of the organization, its aims, activities and accomplishments.

Review of the Wrought Metal Business

Written for The Metal Industry by J. J. WHITEHEAD, President of the Whitehead Metal Products Company of N. Y., Inc.

The demand for products of brass, copper, Monel metal, nickel and nickel alloys still continues very heavy with deliveries getting farther and farther behind. This is especially true of the situation surrounding brass and copper rod, sheet, tube and wire. The mills are making no promises whatever, and state that they are turning down more orders than they are accepting. The delivery situation is especially bad on small brass rods for sizes up to about 5/8" and on all sheet brass items.

All of the mills are complaining about the labor situation and it is reported that among the western mills the labor conditions are especially bad and likely to become worse. In most, if not in all of the mills there have been wage increases made effective during the past month or two and these wage increases have been reflected in advancing prices for the products. During the month of March very radical increases in brass products were made, not only in the base prices, but, also in the extras. The discount from extras which has been in effect for many years past has been entirely discontinued and all extras are now quoted net, both in brass and copper on all items.

In some quarters the high prices which are now being quoted have given rise to a feeling of definite anxiety and a fear that there will be a curtailment in the demand due to the substitution of other metals for brass and copper. Also it is felt, that, while general business has been running for some time at an abnormally high speed this cannot be maintained and there are bound to be some reactions. It is felt, that, however slight the reactions may be they may find a reflection in the copper market which will be greatly magnified, and result in a downward action which may be much more violent than these conditions actually warrant.

As opposed to the conservative view expressed above there are those in the trade who feel that the situation is absolutely sound. They point out that the price of copper is not abnormally high, that there has not been any undue speculation in the copper market, that prices on fabricated products are fully in keeping with the prices on other commodities and that the advances are justified, not only because of the wage advances that have been made, but, also in the light of a reasonable return on the enormous amount of capital invested in the mills, which prior to the last six months were run for a long period either without a profit or at a substantial loss.

Very definite progress has been made in the production of Monel metal and nickel, and deliveries on these products are being made in a most satisfactory manner with the exception of a few small sizes of rod. On rods 1" and larger, and sheets of practically all gauges, deliveries are available immediately from warehouse. The situation on the smaller rods is clearing up rapidly and it is expected that during the month the entire line will be in production to such an extent that there will be no delay in securing anything either in Monel metal or nickel. The labor increases have made necessary the advancing of prices on nickel alloys especially on fine wire and the mills producing these items report a large volume of business and generally satisfactory conditions.

Metal Market Review

Written for The Metal Industry by METAL MAN

COPPER

Trading in copper during the last few weeks was in fairly large volume, but periods of dullness were more frequent lately. Selling prices, however, made further gains in March and the electrolytic basis advance from 16 7/8c. to 17 3/8c.

With domestic requirements well covered for the next 30 to 60 days there was less buying by the home trade recently. Producers, however, maintained a firm attitude at 17 1/4c. to 17 3/8c., delivered usual railroad points, for shipment over the next two to three months.

The large holders are in a very comfortable position after the recent heavy sales. Although recent developments tended to check the upward trend of prices, there was no apparent pressure to sell by leading producers. Concessions were obtainable from second hands recently, but the tonnage available at inside prices was in limited supply and are regarded as incidental to a quiet market.

A fresh buying movement is expected to develop in April or May. If new demand in second quarter of year is maintained at present rate producers anticipate continued market firmness with a possible hardening of prices.

ZINC

A good consuming demand has continued and large tonnages have been going to the different industries using zinc. The market here, however, developed irregular features and at times a weakening tendency lately. Current quotations are 8.05 to 8.10 New York, and 7.70 to 7.75 E. St. Louis. When London cables showed a downward tendency in the English market recently the effect upon this market was seen in freer offerings and lower prices. Zinc ore has weakened somewhat compared with quotations a short time ago. Joplin prices, as per latest advices, are $43.50 to $49.00, with sales of 12,000 tons reported. Department of the Interior, as per report released March 27, 1923, makes total zinc production in the United States in 1922, from domestic and foreign sources, including redistilled secondary material, to be 387,230 tons of 2,000 lb. each, against 218,073 tons in 1921. The apparent consumption of primary zinc in this country in 1922 was 371,833 short tons, compared with 203,600 tons in 1921.

TIN

The tin market has been conspicuously erratic and highly sensitive during recent weeks. These features have continued in evidence so long that consumers and local operators have been considerably upset respecting future trade outlook for tin if values are to be subject to sudden and violent fluctuations. The whole situation is largely under speculative control and manipulation abroad. Owing to this condition American consumers are consequently very much at sea as to what course the market is likely to take from day to day; they are consequently very conservative.

April opened with a dull and easy market here on the basis of 47 3/4c. to 48c. for Straits tin for prompt and future deliveries. Later tendency of market developed easier tone at 47 1/2c. to 47 3/4c. for spot and future positions. Buyers are naturally cautious about placing contracts at present quotations.

LEAD

The lead market continues to hold steady on the basis of 8 1/4c. E. St. Louis and 8 1/2c. to 8 3/4c. New York. A large domestic demand has provided a free outlet for supplies and producers have been able to dictate the selling price for many months past. Conditions remain favorable to market strength apparently, and sellers are building on heavy requirements in April and May. There is still a seeming scarcity of prompt lead at Eastern points. Good judges of the situation while recognizing definite signs of market strength deprecate attempts to force prices unduly. Lead interests are reaping enormous benefits under the existing tariff, and under restricted smelting operations consumers will probably continue to pay high prices until business shows signs of a halt. Meanwhile producers are making the most of the phenomenal demand at abnormally high prices.

ALUMINUM

The aluminum market has reached the high level of 27 cents for 99 per cent plus foreign article and 26 1/2c. for 98-99 per cent material. It might be possible to shade these quotations in the open market, but the majority of importers are holding incoming shipments firmly. The controlling domestic makers will

quote only to bona fide buyers. The tariff is lending effective support to the high prices for all consumers of aluminum and aluminum manufactured goods. Foreign agents have also had a good demand on recent importations. Shipments from Europe lately, however, have been greatly curtailed, much to the advantage of the domestic producers.

QUICKSILVER

This article is moving in a very moderate way and prices have been remarkably steady during the last thirty days. The New York quotation is $71 to $72 per flask. Production of quicksilver in the United States in 1922 is placed at 6,497 flasks of 75 pounds net as compared with 6,339 flasks in 1921, the latter being the smallest annual output in the 72 years of recorded production of domestic quicksilver. These figures are those issued by the U. S. Geological Survey.

PLATINUM

Pure platinum is held at $112 an ounce. Demand is of about the usual character at this season. Recent tendency of market has leaned to more firmness.

SILVER

Silver bullion prices have moved within narrow limits recently. Foreign production is quoting 68⅛c. per ounce. Purchases by the U. S. Government under the Pittman Act have been heavy lately. The full quota under this arrangement will be completed within the next few months if present rate of absorption is continued. Miners and producers will then have to face the competition of an open and international market. A special committee of the Senate has been appointed to investigate the world situation on silver and deal with it in a broad and practical way. Efforts are to be made in order to induce the countries of central Europe to make increased use of silver coinage and thus stabilize the currencies of their respective countries. Pressure is to be brought upon Great Britain to restore the normal silver content of her subsidiary coinage, which recently was debased from 925 to 500 fine. The current year will be fraught with exceptional consequences and important results in the history of silver.

ANTIMONY

There has been definite improvement in demand for antimony recently and the market price for Chinese Regulus is now 8¾ to 9 cents duty paid. At the higher figures offerings from China have increased, with indications that shippers would be inclined to accept orders at 7c. c. i. f. New York in bond. Demand has eased up within last few days and the market is not quite as firm as it was. China is more anxious to sell, but it looks as if Far East sellers have overstayed their market and will have to negotiate on lower terms to interest buyers. Carload lots are easy at 8⅞c., New York, duty paid, but futures are 8½c. to 8¾c. and in small request.

OLD METALS

Market activity and a steady demand have been regular features in the market for scrap metals. Business continued in large volume during the past month and dealers were able to make frequent turnovers of stock in store and transit. Scrap copper, copper bearing material, and aluminum scrap were in special request and commanded stiff prices. New brass clippings also found ready sale. Further good demand for the leading scraps are expected to continue during April and May. Buying quotations are more or less variable, but based on selected material at 13¾c. to 14c. for uncrucibled copper wire, 14½c. to 15c. for strictly crucible copper wire, 7½c. to 8c. for heavy brass, 18c. to 20c. for aluminum clippings, 6⅞c. to 7⅛c. for heavy lead, 5c. for battery lead, and 5¼c. to 5½c. for zinc scrap.

WATERBURY AVERAGE

Lake Copper—Average for 1922, 13.844—January, 1923, 14.875—February, 15.75—March, 17.25.

Brass Mill Zinc—Average for 1922, 6.283—January, 1923, 8—February, 8—March, 8.70.

Daily Metal Prices for the Month of March, 1923

Record of Daily, Highest, Lowest and Average

Metal Prices for April 6, 1923

Date	1	2	5	6	7	8	9	12	13	14	15	16	19
Copper (f. o. b. Ref.) c/lb. Duty Free													
Lake (Delivered)	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.50
Electrolytic	16.875	16.875	16.875	16.875	16.625	16.75	16.75	16.75	16.75	16.75	17.00	17.00	17.25
Casting	16.50	16.50	16.50	16.50	16.375	16.375	16.375	16.50	16.50	16.50	16.75	16.75	16.875
Zinc (f. o. b. St. L.) c/lb. Duty 1¼c/lb.													
Prime Western	7.80	7.85	7.90	7.85	7.85	7.80	7.75	7.80	7.85	7.90	7.95	8.00	8.00
Brass Special	7.90	8.00	8.05	8.00	8.00	7.95	7.90	8.00	8.05	8.05	8.10	8.10	8.15
Tin (f. o. b., N. Y.) c/lb. Duty Free.													
Straits	46.875	46.25	46.75	47.25	47.125	47.375	48.00	49.50	51.25	50.00	51.50	51.375	50.25
Pig 99%	45.75	45.00	45.50	45.75	45.50	45.75	46.25	48.00	49.75	47.875	49.50	49.50	48.25
Lead (f. o. b., St. L.) c/lb. Duty 2½c/lb.	8.35	8.40	8.50	8.50	8.50	8.45	8.45	8.45	8.30	8.30	8.30	8.30	8.25
Aluminum c/lb. Duty 5c/lb.	25.50	25.50	26.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00
Nickel c/lb. Duty 3c/lb.													
Ingot—Internat. Nick. Co.	29	29	29	29	29	29	29	29	29	29	29	29	29
Outside Spot	29	29	29	29	29	29	29	29	29	29	29	29	29
Electrolytic (Internat. Nick. Co.)													
Ni.—99.80 contam. impur.—14	32	32	32	32	32	32	32	32	32	32	32	32	32
Brit.-Amer. Nick. Corp.													
Ni.—98.50 contam. impur.—.80	30	30	30	30	30	30	30	30	30	30	30	30	30
Antimony (J. & Ch.) c/lb. Duty 2c/lb.	7.75	8.25	8.75	8.875	9.00	9.00	9.00	9.00	9.00	8.85	8.85	8.85	8.75
Silver (foreign) c/oz. Duty Free	66.625	66.00	67.00	67.25	67.00	66.75	67.00	68.25	67.50	68.125	67.625	67.50	67.125
Platinum $/oz. Duty Free	110	110	110	110	110	108-10	108-10	108-10	108-10	108-10	108-10	108-10	108-10

Date	20	21	22	23	26	27	28	29	30	High	Low	Av.	AM 6
Copper (f. o. b. Ref.) c/lb. Duty Free									Holiday				
Lake (Delivered)	17.375	17.375	17.50	17.50	17.375	17.375	17.375	17.375	...	17.50	17.25	17.312	17.375
Electrolytic	17.25	17.25	17.25	17.25	17.125	17.00	17.125	17.125	...	17.25	16.625	16.976	17.125
Casting	16.875	16.875	16.875	16.875	16.75	16.75	16.75	16.875	...	16.875	16.375	16.649	16.875
Zinc (f. o. b. St. L.) c/lb. Duty 1¼c/lb.													
Prime Western	8.00	8.00	8.00	8.00	7.90	7.80	7.80	7.75	...	8.00	7.75	7.883	7.50
Brass Special	8.15	8.15	8.15	8.15	8.10	8.00	8.00	7.95	...	8.15	7.90	8.043	7.70
Tin (f. o. b., N. Y.) c/lb. Duty Free.													
Straits	49.375	48.625	49.50	49.375	47.75	47.375	47.875	48.25	...	51.50	46.25	48.649	46.875
Pig 99%	47.75	47.00	47.75	47.50	45.75	45.125	46.00	46.325	...	49.75	45.00	46.935	45.00
Lead (f. o. b., St. L.) c/lb. Duty 2½c/lb.	8.25	8.25	8.25	8.25	8.25	8.25	8.25	8.25	...	8.50	8.25	8.336	8.20
Aluminum c/lb. Duty 5c/lb.	26.00	26.00	26.00	27.00	27.00	27.00	27.00	27.00	...	27.00	25.50	26.190	27.00
Nickel c/lb. Duty 3c/lb.													
Ingot—Internat. Nick. Co.	29	29	29	29	29	29	29	29	...	29	29	29	29
Outside Spot	29	29	29	29	29	29	29	29	...	29	29	29	29
Electrolytic (Internat. Nick. Co.)													
Ni.—99.80 contam. impur.—14	32	32	32	32	32	32	32	32	...	32	32	32	32
Brit.-Amer. Nick. Corp.													
Ni.—98.50 contam. impur.—.80	30	30	30	30	30	30	30	30	...	30	30	30	30
Antimony (J. & Ch.) c/lb. Duty 2c/lb.	8.75	8.75	8.75	8.75	8.75	9.00	9.00	9.00	...	9.00	7.75	8.794	8.75
Silver (foreign) c/oz. Duty Free	67.875	67.625	67.375	67.75	67.75	65.625	68.50	68.375	...	68.50	65.625	67.363	66.375
Platinum $/oz. Duty Free	110	110	110	110	112	112	112	112	...	112	108	110	115

Metal Prices, April 9, 1923

INGOT METALS AND ALLOYS

Brass Ingot, Yellow	12½to14
Brass Ingots, Red	15 to17½
Bronze Ingot	15½to18½
Bismuth	$2.85
Cadmium	$1.25
Casting Aluminum Alloys	21 to24
Cobalt—97% pure	$3.25
Manganese Bronze Castings	22 to35
Manganese Bronze Ingots	14 to18
Manganese Bronze Forging	33 to42
Manganese Copper, 30%	28 to45
Magnesium Metal	$1.25-1.50
Parsons Manganese Bronze Ingots	21 to23
Phosphor Bronze	24 to30
Phosphor Copper, guaranteed 15%	21½to26
Phosphor Copper, guaranteed 10%	21 to25
Phosphor Tin, guarantee 5%	48 to58
Phosphor Tin, no guarantee	46 to56
Quicksilver	$70-71
Silicon Copper, 10%.....according to quantity	28 to35

OLD METALS

Buying Prices		Selling Prices
13½to13¾	Heavy Cut Copper	14½to15
13¼to13½	Copper Wire	14¼to14¾
11¼to11½	Light Copper	12½to13
11 to11½	Heavy Machine Comp.	13 to13½
8½to 9	Heavy Brass	10½to11
6¾to 7¼	Light Brass	8½to 9
8½	No. 1 Yellow Brass Turnings	9 to 9½
10 to10½	No. 1 Comp Turnings	11¼to11¾
6¼to 6½	Heavy Lead	7 to 7¼
4½	Zinc Scrap	5 to 5¼
10 to10½	Scrap Aluminum, Turnings	12½to13
16 to16½	Scrap Aluminum, cast alloyed	18 to18½
17 to18	Scrap Aluminum, sheet (new)	19 to20
24	No. 1 Pewter	28
15	Old Nickel anodes	17
23 to25	Old Nickel	27 to29½

BRASS MATERIAL—MILL SHIPMENTS

In effect March 29, 1923

To customers who buy 5,000 lbs. or more in one order.

	Net base per lb.		
	High Brass	Low Brass	Bronze
Sheet	$0.21¾	$0.23½	$0.25⅜
Wire	0.22¼	0.24	0.25⅞
Rod	0.20	0.24¼	0.26⅛
Brazed tubing	0.29¾	.....	0.35⅛
Open sea tubing	0.29¾	.....	0.35⅛
Angles and channels	0.32¾	.....	0.38⅛

To customers who buy less than 5,000 lbs. in one order.

	Net base per lb.		
	High Brass	Low Brass	Bronze
Sheet	$0.22¾	$0.24½	$0.26⅜
Wire	0.23¼	0.25	0.26⅞
Rod	0.21	0.25¼	0.27⅛
Brazed tubing	0.30¾	.....	0.36⅛
Open seam tubing	0.30¾	.....	0.36⅛
Angles and channels	0.33¾	.....	0.39⅛

SEAMLESS TUBING

Brass, 26½c. to 27½c. per lb. base.
Copper, 28c. to 29c. per lb. base.

TOBIN BRONZE AND MUNTZ METAL

Tobin Bronze Rod	23¾c. net base
Muntz or Yellow Metal Sheathing (14"x48")	21¾c. net base
Muntz or Yellow Rectangular Sheets other than Sheathing	22¾c. net base
Muntz or Yellow Metal Rod	19¾c. net base

Above are for 100 lbs. or more in one order.

COPPER SHEET

Mill shipments (hot rolled)	25½c. to 26½c.
From stock	26½c. to 27½c.

BARE COPPER WIRE—CARLOAD LOTS

20c. to 20¼c. per lb. base.

SOLDERING COPPERS

300 lbs. and over in one order	23¾c. per lb. base
100 lbs. to 200 lbs. in one order	24¼c. per lb. base

ZINC SHEET

Duty, sheet, 15%. Cents per lb.

Carload lots, standard sizes and gauges, at mill, 10c. basis less 8 per cent. discount.

Casks, jobbers' prices	11¼c. to 12c.
Open casks, jobbers' prices	12c. to 13c.

ALUMINUM SHEET AND COIL

Aluminum sheet, 18 ga. and heavier, base price	37c.
Aluminum coils, 24 ga. and heavier, base price	35c.
Foreign	42c.

NICKEL SILVER (NICKELENE)

Base Prices

Grade "A" Nickel Silver Sheet Metal

10% Quality	28¾c.	per lb.
15% "	30c.	per lb.
18% "	31c.	per lb.

Nickel Silver Wire and Rod

10% "	31½c.	per lb.
15% "	35c.	per lb.
18% "	38c.	per lb.

MONEL METAL

Shot	32
Blocks	32
Hot Rolled Rods (base)	40
Cold Drawn Rods (base)	46
Hot Rolled Sheets (base)	45

BLOCK TIN SHEET AND BRITANNIA METAL

Block Tin Sheet—18" wide or less. No. 26 B. & S. Gauge or thicker, 100 lbs. or more, 10c. over Pig Tin. 40 to 100 lbs., 15c. over 25 to 50 lbs., 17c. over, less than 35 lbs., 25c. over.

No. 1 Britannia—18" wide or less. No. 26 B. & S. Gauge or thicker, 500 lbs. or over, 8c. over N. Y. tin price; 100 lbs. or more, 10c. over Pig Tin. 50 to 100 lbs., 15c. over, 25 to 50 lbs., 20c. over, less than 25 lbs., 25c. over. Above prices f. o. b. mill.

SILVER SHEET

Rolled silver anodes .999 fine are quoted at from 71½c. to 73½c. per Troy ounce, depending upon quantity.

Rolled sterling silver 68½c. to 70½c.

NICKEL ANODES

85 to 87% purity	31½c.-34c. per lb.
90 to 92% purity	34c. -37c. per lb.
95 to 97% purity	36c. -39c. per lb.

Supply Prices, April 9, 1923

CHEMICALS

In Commercial Quantities—New York Prices

Acetone	lb.	.22–.24
Acid—		
Boric (Boracic) Crystals	lb.	.12
Hydrochloric (Muriatic) Tech., 20 deg., Carboys	lb.	.02
Hydrochloric, C. P., 20 deg., Carboys	lb.	.08
Hydrofluoric, 30%, bbls.	lb.	.08
Nitric, 36 deg. Carboys	lb.	.06
Nitric, 42 deg. Carboys	lb.	.07
Sulphuric, 66 deg. Carboys	lb.	.02
Alcohol—		
Butyl	lb.	.35–.30
Denatured in bbls.	gal.	.36–.43
Alum—		
Lump, Barrels	lb.	.04
Powdered, Barrels	lb.	.04½
Aluminum sulphate, commercial tech	lb.	.02½–.03
Aluminum chloride solution	lb.	.22
Ammonium—		
Sulphate, tech., Barrels	lb.	.03¾
Sulphocyanide	lb.	.65
Argols, white, see Cream of Tartar	lb.	.27
Arsenic, white, Kegs	lb.	.16
Asphaltum	lb.	.35
Benzol, pure	gal.	.60
Blue Vitriol, see Copper Sulphate.		
Borax Crystals (Sodium Biborate), Barrels	lb.	.06
Calcium Carbonate (Precipitated Chalk)	lb.	.04
Carbon Bisulphide, Drums	lb.	.07
Chrome Green	lb.	.36
Cobalt Chloride	lb.	—
Copper—		
Acetate	lb.	.37
Carbonate, Barrels	lb.	.20
Cyanide	lb.	.46
Sulphate, Barrels	lb.	.06½
Copperas (Iron Sulphate, bbl.)	lb.	.02
Corrosive Sublimate, see Mercury Bichloride.		
Cream of Tartar, Crystals (Potassium bitartrate)	lb.	.27
Crocus	lb.	.15
Dextrin	lb.	.05–.08
Emery Flour	lb.	.06
Flint, powdered	ton	$30.00
Fluor-spar (Calcic fluoride)	ton	$75.00
Fusel Oil	gal.	4.40
Gold Chloride	oz.	14.00
Gum—		
Sandarac	lb.	.26
Shellac	lb.	.82–1.00
Iron, Sulphate, see Copperas, bbl.	lb.	.02
Lead Acetate (Sugar of Lead)	lb.	.13
Yellow Oxide (Litharge)	lb.	.12½
Mercury Bichloride (Corrosive Sublimate)	lb.	1.15
Nickel—		
Carbonate Dry	lb.	.40
Chloride, 100 lb. lots	lb.	.22½–.40
Salts, single, bbls	lb.	.11½
Salts, double, bbl	lb.	.10½
Parrafin	lb.	.05–.06
Phosphorus—Duty free, according to quantity		.35–.40
Potash, Caustic, Electrolytic 88-92% fused, drums	lb.	.09
Potassium Bichromate, casks	lb.	.11
Carbonate, 80-85%, casks	lb.	.06
Cyanide, 165 lb. cases, 94-96%	lb.	.65
Pumice, ground, bbls	lb.	.02½
Quartz, powdered	ton	$30.00
Official	oz.	—
Rosin, bbls.	lb.	.03½
Rouge, nickel, 100 lb. lots	lb.	.25
Silver and Gold	lb.	.65
Sal Ammoniac (Ammonium Chloride) in casks	lb.	.08
Silver Chloride, dry	oz.	.86
Cyanide	oz.	—
Nitrate, 100 ounce lots	oz.	.46
Soda Ash, 58%, bbls	lb.	.02½
Sodium—		
Biborate, see Borax (Powdered), bbls	lb.	.06
Cyanide, 96 to 98%, 100 lbs	lb.	.23
Hyposulphite, kegs	lb.	.04
Nitrate, tech. bbls	lb.	.03
Phosphate, tech., bbls	lb.	.03¾
Silicate (Water Glass) bbls	lb.	.02
Sulpho Cyanide	lb.	.45
Soot, Calcined	lb.	—
Sugar of Lead, see Lead Acetate	lb.	.12–.13
Sulphur (Brimstone) bbls	lb.	.02
Tin Chloride, 100 lb. kegs	lb.	.37
Tripoli	lb.	.03
Verdigris, see Copper Acetate	lb.	.37
Water Glass, see Sodium Silicate, bbls	lb.	.02½
Wax—		
Bees, white ref. bleached	lb.	.55
Yellow, No. 1	lb.	.35
Whiting, Bolted	lb.	.02½–.06
Zinc, Carbonate, bbls	lb.	.13–.17
Chloride, 600 lb. lots	lb.	.07
Cyanide	lb.	.37
Sulphate, bbls.	lb.	.03¼

COTTON BUFFS

Open buffs, per 100 sections (nominal).

12 inch, 20 ply, 64/68, cloth	base,	42.95
14 inch, 20 ply, 64/68, cloth	base,	53.40
12 inch, 20 ply, 84/92, cloth	base,	51.05
14 inch, 20 ply, 84/92, cloth	base,	68.80
12 inch, 20 ply, 88/96, cloth	base,	58.35
14 inch, 20 ply, 88/96, cloth	base,	78.60
Sewed Buffs, per lb., bleached and unbleached	base,	.60

FELT WHEELS

		Price Per Lb. Less Than 100 Lbs.	300 Lbs. and Over
Diameter—10″ to 16″	1″ to 3″	2.75	2.50
" 6″ 8″ and over 16″	1″ to 3″	2.85	2.60
" 6″ to 24″	Over 3″	3.15	2.80
" 6″ to 24″	½″ to 1″	3.75	3.50
" 4″ to 6″	¼″ to 3″	4.75	Any quantity.
" Under 4″	¼″ to 3″	5.35	

Grey Mexican or French Grey—10c. less per lb. than Spanish, above. Odd sizes, 50c. advance.